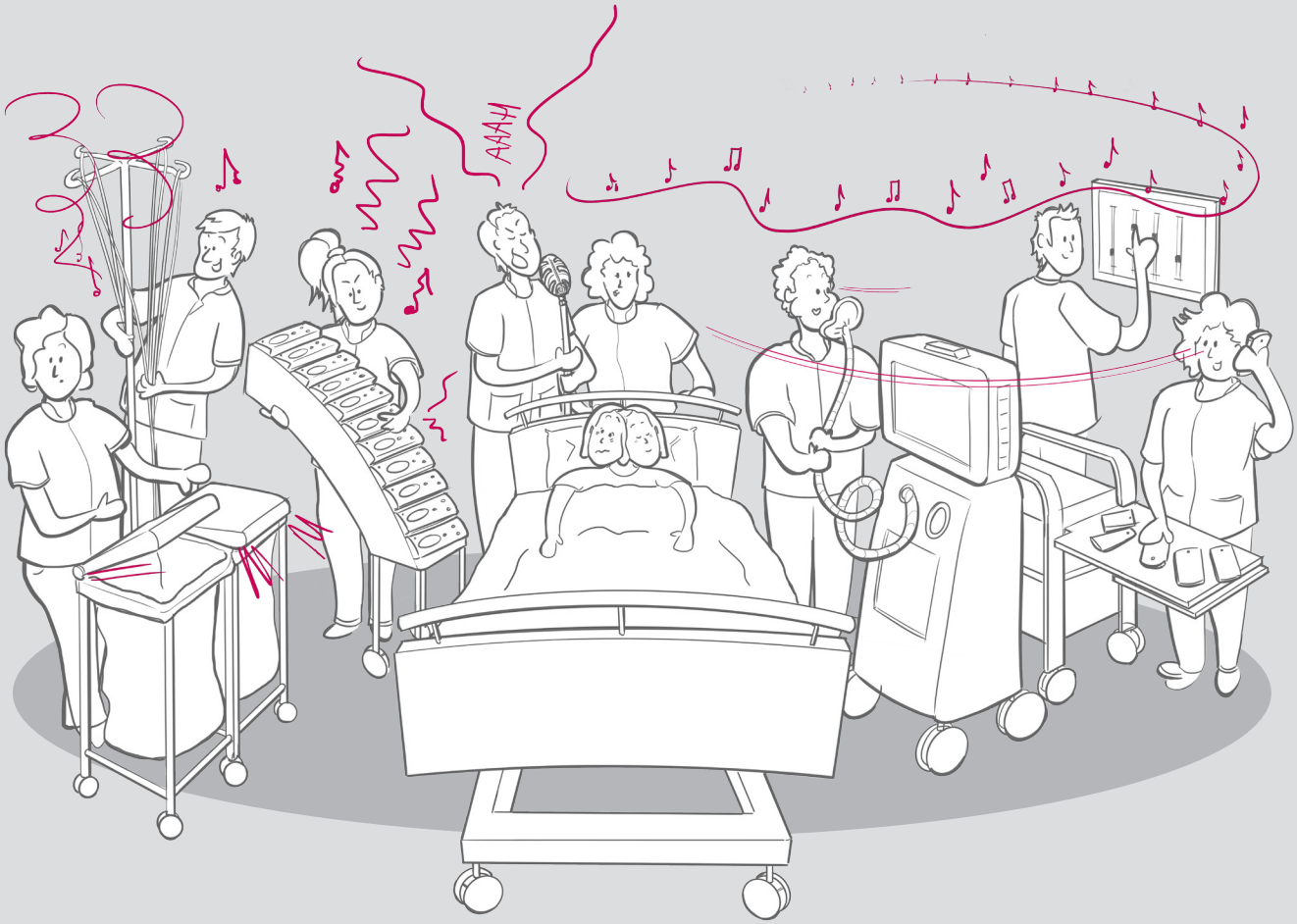
Sound Cultures of Critical Care

How design could tune sound-related practices of intensive care nurses



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Master thesis - Design for Interaction
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Sound Cultures of Critical Care - how design could tune sound-related practices of intensive care nurses

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This thesis describes the design and research process of my graduation project commissioned by the Critical Alarms Lab, in order to obtain the Master's degree in Design for Interaction, Faculty of Industrial Design Engineering at the Delft University of Technology. The thesis shows the procedure of capturing and typifying the current intensive care sound cultures and how design could tune sound-related practices of intensive care nurses. With the gathered insights and the resulting campaign that supports my vision of creating a more collectivistic sound culture, I want to motivate managers and nurses of intensive care units to participate in the process of sound cultural change.

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EXECUTIVE SUMMARY

SOUND ISSUES IN INTENSIVE CARE

The intensive care unit (ICU) is a special department of the hospital that admits critically ill patients who need intensive monitoring, supporting, and/or take-over of one or more of their vital functions. The patients are monitored and supported by medical equipment as well as a team of intensivists, nurses and other medical staff members 24/7. Due to the audible alarms of the devices, but also because of conversations of people being present in the ICU and other machinery and incidental sounds, the ICU transformed into an acoustically hostile environment. Ironically, the ICU's excessive amount of sounds threatens both patient safety and clinicians' wellbeing and work efficiency.
In light of these sound issues in the ICU, this graduation assignment aimed to capture the ICU nurses' sound-related values and practices and to develop an understanding of the phenomenon of sound in a sociocultural context – the so-called 'ICU sound culture'. By understanding the ICU sound culture, the second aim of the assignment was to look for opportunities for silencing down the ICU whilst considering the sound cultures.

CAPTURING INTENSIVE CARE SOUND CULTURES

The first aim of the assignment, capturing and typifying different ICU sound cultures, was addressed in a field research study with a procedure based on contextmapping. Data was collected through a period of observing six different ICUs and interviewing a varied selection of nine ICU nurses. After an on-the-wall-analysis (Sanders & Stappers, 2012), with the interview transcripts as main input, the research findings showed that nurses working in the same Dutch ICU and nurses working in different ICUs share three (sound-related) core values: autonomously working (together), being situationally aware, and giving and receiving social support. It seems that the accompanying practices are transmitted through learning and typical for the Dutch ICU (sound) culture. However, nurses from different ICUs, but also nurses of one and the same team, could differ in their value orientations and practicing these. As a result, the nurses could be divided into three types based on shared customs, beliefs and needs, called 'personas'. So, the field research showed that similarities and differences exist due to ICU specific sound cultures and ICU specific group cultures within one and the same team.

The first two ICU nurse types discovered (Persona 1: Opinionated Professional; Persona 2: Assertive Ally) are experienced ICU nurses. They are confident in taking medical actions and have a high situational awareness. Persona 1 and 2 are both sensitive to sounds, because it harms their autonomous way of working (e.g. by an affected concentration) and situational awareness respectively. Due to their confidence and sensitivity to sounds, they set broad alarm boundaries in general, meaning that the monitoring devices will alarm less quickly. The third nurse type (Persona 3: Docile novice) is a less experienced nurse or a nurse who is new into an environment (such as a flex worker). He or she needs to get familiar with the environment as a whole and/or the medical devices. Due to his or her lack of situational awareness and also because he or she sees sound as part of the job, persona 3 sets tight alarm limits in general – (s)he needs the alarms to work safely.

HOW DESIGN CAN CONTRIBUTE TO A MORE PEACEFUL SOUND ENVIRONMENT

The understanding of the ICU nurses' (sound-related) values and practices could be helpful for designers when developing design interventions for the purpose of sound-reduction. They could, for example, carefully tune their designs with the ICU nurses' existing beliefs and shared core values in such a way that the designs limit/avoid sound-inducing practices or encourage nurses to act on sound-producing events. Despite the fact that designers could make a difference in shaping the material culture, I see a big challenge in making the nurses aware of the 'sound problem' for which they are partly responsible. This is inspired by a commonality regarding the 'sound problem' (i.e. the excessive amount of sounds in an ICU) discovered during the field research: in all ICUs, the sounds, or even issues with them, are sort of accepted to a greater or lesser extent due to nurses not knowing why (by being ignorant or indifferent) or not knowing how to reduce sounds. Additionally, the current sound-reducing efforts that do exist are often taken individually, ad-hoc and they have a short-term impact. When ICUs want to reduce the sounds with a bigger impact in the longer term, ICUs need to create 'sound-issue awareness' and motivate every nurse to act upon the sound issues.

A CAMPAIGN FOR SOUND CULTURAL CHANGE

To support ICUs in sound-reduction with a bigger impact, I developed a campaign that supports and challenges the ICU management team and nurses to establish a 'collectivistic sound culture'. In a collectivistic sound culture, every individual nurse should commit to the group effort and goal to create a more peaceful sound environment in the ICU. To let nurses behave 'sound-consciously' – i.e. knowing the effect of your and others' behaviour on the sound environment and acting upon that – nurses have to admit that they need to change their current sound culture towards the collectivistic sound culture, and that they also have opportunities for doing so when everybody shows involvement. Through three practical campaign tools (the spark poster, conversation cube and sound cultura), the nurses will work on achieving and practicing the mindset of 'we need to change' and 'we can change' from bottom-up. The ICU management team will act as a top-down initiator and facilitator. Since a change of minds and behavioural change among the nurses will take time, the actual impact of the campaign can only be measured after a period of time. However, the first group discussions elicited by the tools and research findings among the management team and ICU nurses, and the participating ICUs' interest in getting to know their sound culture, are good first steps in the joint realization of a more peaceful sound environment.

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INTRODUCTION

As a Master's student of Design for Interaction, I believe that people are the centre of attention when designing meaningful products and services. By doing contextual research and involving the user in the design process, I aim for getting a thorough understanding of the user's experiences, values and needs. Exploring contexts I am unfamiliar with challenges me to reach deeper levels of knowledge and to come up with interventions that bring about positive behavioural change. My graduation project, commissioned by the Critical Alarms Lab (Delft University of Technology), was a great opportunity to put this vision into practice. This chapter describes the aim of the graduation project, the research questions and the cultural-conscious approach taken. It gives you a first glance of the raison d'être of the campaign I developed over time – a campaign that aims for positive sound cultural change in one of the most challenging contexts I have investigated so far: the intensive care unit (ICU).

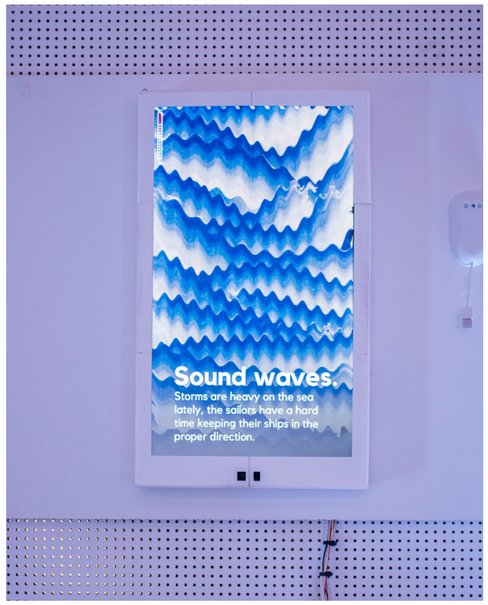


figure 1 – A prototype of Doplor, one of the design interventions of the Critical Alarms Lab, created by Redert (2018). The interactive painting should make nurses aware of their sound-inducing behaviour. Picture from Jimena Gauna for Waag, Embassy of Health.

1.1 · SOUND ISSUES IN THE INTENSIVE CARE UNIT (ICU)

The intensive care unit (ICU) is a special department of the hospital that admits critically ill patients who need intensive monitoring, supporting, and/or take-over of one or more of their vital functions (e.g. circulatory system, lungs, kidneys). The patients are monitored and supported by medical equipment as well as a team of intensivists, nurses and other medical staff members 24/7. The monitoring devices have audible or visual alarms: when the patient's bodily parameters slightly change, the devices give an audible or visual warning on the device itself (in the patient room or corridor) and/or on a portable pager that nurses might have (personal observation, October 5, 2018). Therefore, the devices give clinicians, especially the nurses, the ability to be aware of the patient's status continuously (Bogers, 2018; Salomé, 2018).
Due to the audible alarms of the devices, but also because of conversations of people being present in the ICU and other machinery and incidental sounds, the ICU transformed into an acoustically hostile environment (Redert, 2018). Clinicians become less sensitive to the alarms (called 'alarm fatigue') and do not act upon them (Kristensen et al., 2016). Additionally, patients' sleep patterns are disturbed, or they can even have delirium. So ironically, the ICU's excessive amount of sounds threatens both patient safety and clinicians' wellbeing and work efficiency.

1.1.1 AIMING FOR A SILENT ICU

In light of these sound issues in the ICU, the Critical Alarms Lab initiated multiple research and design projects in order to reduce sounds in the ICU – called the 'Silent ICU'. The Lab consists of an international team of students and researchers as well as care professionals and manufacturers, and contains a living lab at the Erasmus Medical Center (Erasmus MC) in Rotterdam. Most of the Lab's final designs are highly based on contextual research findings in Erasmus MC's ICU and aim to fit the nurses' needs. For example, former graduate student Redert (2018) analysed the sounds sources in an ICU (i.e. alarms, speech, incidental and background sounds), and found out that three of them (i.e. alarms, speech and incidental sounds) are elicited by one's behaviour (see figure 1). Redert's (2018) final design is an interactive painting on the wall that corresponds to the sound levels in the ICU accordingly. By changing shapes and colours, the painting shows when sounds become disturbing, which is partly a result of the nurses' own behaviour. In this way, nurses should become more aware of the noisy environment and their own contribution, and, desirably, act upon it. Just like the Critical Alarms Lab's other research and design projects, the aim of Doplor is to create a more peaceful atmosphere in the ICU.

Sound-producing behaviour induced by the context
The sounds are not solely induced by nurses: the physical ICU environment in which they have to interact is of influence as well. Both Redert (2018), who had the opportunity to do research at both the old and new ICU department of Erasmus MC, and nurses I talked to during personal observations (October 5, 2018), indicate that the new ICU layout changed a clinician's workflow and behaviour. For example, one of them mentioned they have to converse more in the corridor due to the decentralized nursing desks and lack of cameras in the patient rooms. This practice is a good example of how the physical environment and one's and others' needs influence the clinicians' (sound-producing) behaviour. Moreover, it elicits the opportunity for designers to map and rethink the clinicians' values and sound-related practices.

1.2 · PROBLEM DEFINITION

The people being present in the ICU (i.e. clinicians, non-clinical staff, patients and visitors) deal with all the sounds depending on what they perceive as 'good' and 'bad', about how they have to act in certain situations (the do's and don'ts), and also through people's own cultural background. For example, there are explicit rules that inform them (such as by training or text on the wall), and more implicit rules (such as by talking quietly when someone is asleep). The interplay of people's beliefs, norms, skills and capabilities, and the ICU's physical environment is manifested in what people do, say and how they behave; their daily practices (Van Boeijen, 2014).

Though sound issues in the ICU are a universal problem, little is known about how different ICUs and the people being present deal with all the sounds and what can be done with that. Therefore, there was an opportunity for capturing the people's sound-related values and practices and to develop an understanding of the phenomenon of sound in a sociocultural context – the so-called 'ICU sound culture'. This could serve as input for addressing the sound issues. Since the Critical Alarms Lab deem the ICU nurses as the backbone of the ICU, and, as one mentioned himself, as the 'advocate of the patient' (personal observations, October 5, 2018), the ICU sound cultures were captured and typified from an ICU nurse perspective. Additionally, it was expected that nurses show similarities and differences in their values and practices, so a variety of ICUs were investigated. This way, the sounds issues could be understood from a local culture-specific and more universal point of view. By understanding the ICU sound culture, the second aim of the project was to look for opportunities for silencing down the ICU whilst considering the sound cultures.

1.2.1 RESEARCH QUESTIONS

1. What are the shared values and practices in different ICU sound culture(s)?
   a. What are the core values and needs of ICU nurses, especially when dealing with the sounds in the ICU (i.e. alarms, speech, incidental and background sounds)?
   b. In what way do the ICU nurses practice these (sound-related) core values and needs?
   c. How uniform are ICU nurses in practicing these (sound-related) values and needs?
2. How can design contribute to sound reduction in the ICU whilst considering the ICU sound cultures?

1.3 · APPROACH

The project consisted of four phases that are inspired by the Design Council's (2005) "Double Diamond Design process": 'Discover', 'Define', 'Develop', 'Deliver'. See figure 2 how these phases are linked to the structure of this report. The 'Discover' phase addressed the first research question. The aim was to capture the current ICU sound cultures of different Dutch ICUs during a field research study, and to typify them textually and visually. After the 'Discover' phase, I bridged the gp from research to design in the 'Define' phase (Sanders & Stappers, 2012): the aim was to find and define opportunities for reducing sounds in the ICU whilst considering the ICU sound cultures (see second research question). In the next phases, 'Develop' (or rather: 'Design') and 'Deliver', I developed a campaign, consisting of several physical tools, that aims for changing the current ICU sound culture. This development was guided by the findings found in the 'Discover' phase, the directions set in the 'Define' phase and the actual involvement of a nursing team lead and nurses. The development of the campaign and the involvement of these people helped in finetuning the understanding of the current ICU sound cultures too. So generally speaking, the phases were, especially at the end of the project, intertwined.

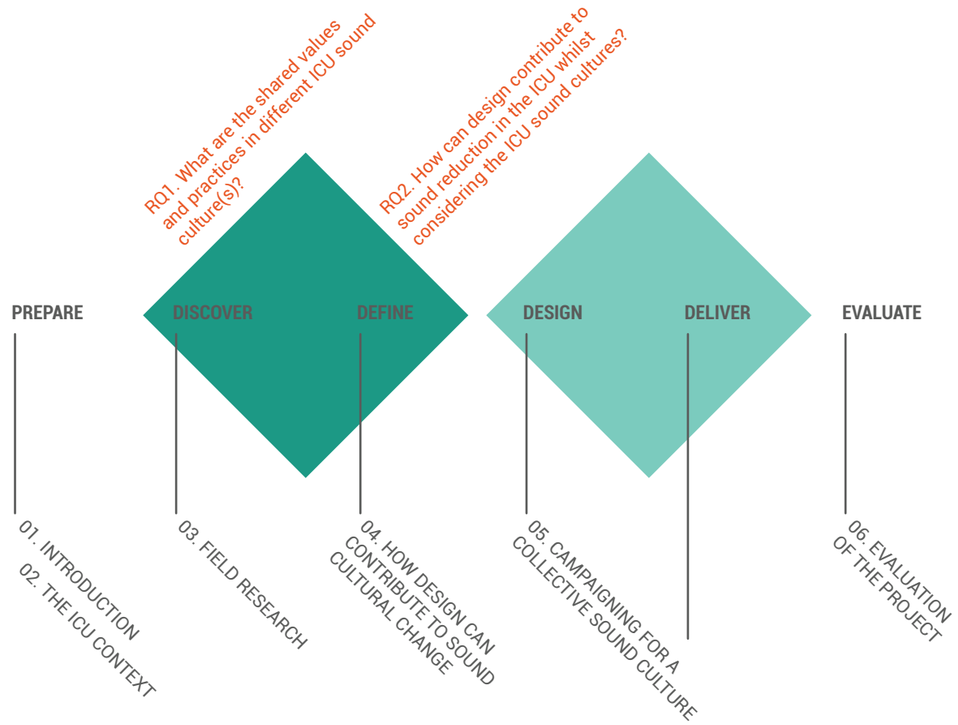


figure 2 – The project approach as it was executed, inspired by the Design Council's (2005) "Double Diamond Design process". Each chapter of the report belongs to a particular phase. See appendix A for the original project brief and approach.

1.3.1 A CULTURAL-CONSCIOUS APPROACH

During the field research study and design phase, I took a cultural-conscious approach. Generally speaking, such an approach could help designers in getting an understanding of the end users' sociocultural values in a certain cultural context they are designing for. This understanding gives designers directions for the functions, properties and final form of the design, whether their design aims to affirm, tune, change, bridge or bypass cultural aspects (Van Boeijen, 2011). In light of this project, the approach helped in understanding the (sound-related) values and practices of ICU nurses and their behavioural effects on the sound environment – as individuals and as a group. Additionally, it supported the development of my vision on the current ICU sound cultures and how design could tune sound-related practices of ICU nurses.

Toolkits for taking a cultural-conscious approach

The taken cultural-conscious approach is inspired by two design tools: one that is created by Van Boeijen (2011) and one that is created by Hao et al. (2017). The first design tool consists of a set of cards that help designers to take a cultural lens in order to examine the culture of the end users they are designing for (see appendix B). The second design tool, called 'Cultura', describes nine cultural aspects that help designers in gaining empathy with their end users in a broader cultural context (see appendix C for an explanation of all the aspects). Both toolkits are meant for designers in order to get an understanding of the intended users in a cultural context (which they might not be familiar with), helping them "to make effective designs for people" (Hao et al., 2017). For this project, the toolkits mainly helped in setting up the field research and conducting the analysis with a cultural lens.

1.4 · WHAT IS A '(SOUND) CULTURE'?

For this project, the term culture was defined as "the system of shared beliefs, values, customs, behaviours and artefacts that members of a society use to cope with their world and with one another, and that are transmitted through learning" (cited in van Boeijen, 2011). With the placement of the sound phenomenon in a sociocultural context and investigating this phenomenon from the perspective of an ICU nurse, the following definition for the 'ICU sound culture' was used: "the system of shared beliefs, values, customs, behaviours and artefacts that ICU nurses use to cope with the ICU sound environment and with one another, and that are transmitted through learning" (based on van Boeijen, 2011). A critical note to this is that the definition implies that certain beliefs, for example, are used to cope with the sound environment, but the other way around is also true: the sound environment shapes the ICU nurses' beliefs as well.

1.4.1 THE MATERIAL CULTURE

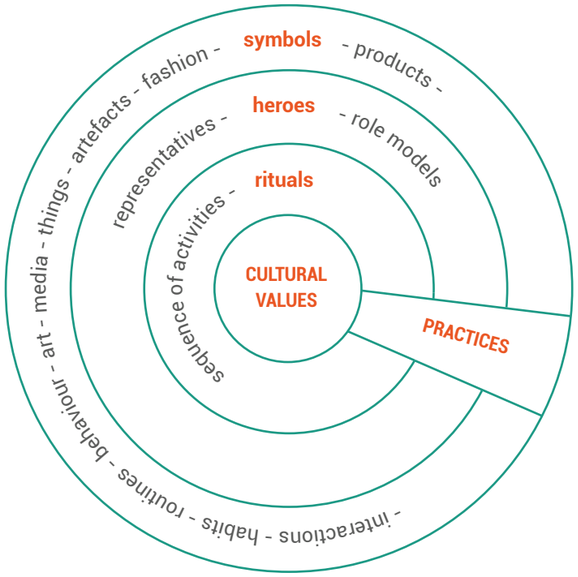
According to Van Boeijen (2011) and Hao et al. (2017) the 'material world' – that is, the artefacts: products, services, or things that people in a specific context use in their everyday lives – influences a culture. Sound in the ICU context is not necessarily coming from products and things, but a nurse's conversing behaviour might still be induced by the physical environment of the ICU. Therefore, during the field research study extra attention was paid to what Van Boeijen (2011) and Hao et al. (2017) call the 'material culture'.

1.4.2 VALUES AND PRACTICES

According to Van Boeijen (2011), "cultures manifest in different ways", wherein (cultural) values are practiced in a certain manner. Van Boeijen (2011) uses Hofstede's (2005) onion model as a metaphor to explain how these hidden values are manifested in the world (see figure 3). At the core of the onion model, i.e. the culture, are the (cultural) values, which Van Boeijen (2011) explains as "broad tendencies in a group to prefer certain states of affairs above others; they are more valuable or important. Values are about behaviour that is desired or aspired to. They are about 'what should' and 'what should not'; people learn them as children, and apply them gradually in practice." The values are elicited through what people do, say and how they behave – their daily practices. These practices take shape in the form of 'symbols' (e.g. objects, art, interactions, clothing, gestures, language), 'heroes' (e.g. role models or an anti-hero), and 'rituals' (i.e. meaningful activities that are shared by the group). Each category represents a different layer that builds up the cultural onion model (Van Boeijen, 2011).

1.4.3 SOCIOCULTURAL DIMENSIONS

To typify cultures and to "help designers determine along which dimensions values and related practices can be viewed" in a certain context, Van Boeijen (2011) developed a set of sociocultural dimensions. This set of dimensions helps in understanding how certain values are orientated, for example: how do ICU nurses deal with hierarchy among the team members or how much room is given to them for self-expression? Especially during the analysis phase, the dimensions were used as guidelines to map the values and related practices and to discover what is typical for the ICU sound culture(s) (see appendix B for further explanation about the used sociocultural dimensions).



The value 'belonging' could be manifested in rituals such as having lunch together or sharing experiences with your colleagues before starting the work day. These kind of rituals could be enhanced by role models in the context, such as a team lead who puts many attention to team dynamics, but also by someone who is not literally present in the context, such as a famous actor. Lastly, the value could be represented or shaped by products in the context, such as a reception counter in the ICU corridor that invites nurses to have a quick chat with each other or the introductory letters of new colleagues at the notice-board in the lunch room

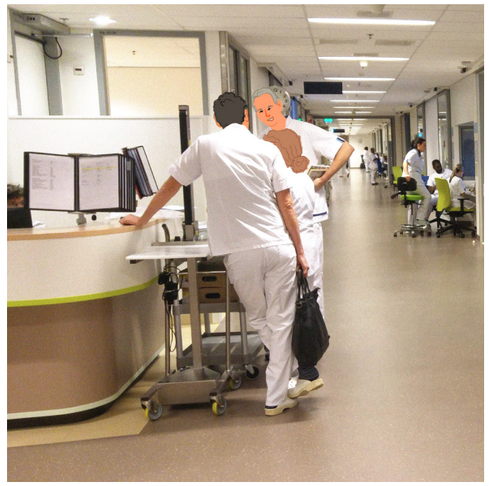


figure 3 – The onion model as it is cited by Van Boeijen (2011). The value 'belonging' is given as an example how such a value could be elicited through the different layers. The picture taken at Erasmus MC's ICCU shows how the practices are observable in the world.

02

THE ICU CONTEXT

This chapter gives detailed information about the context of an Adult intensive care unit (ICU), covering different subjects that are important for understanding the scope of this project, the results of the field research and the actual design of the campaign. The chapter shows which types of ICUs exist and gives an impression of an ICU's physical environment – called the 'material culture' – the people being present in an ICU, a day shift of an ICU nurse and the relation between the ICU nurses and patients in general. Broadly speaking, the descriptions apply to all ICUs that participated in the field research. The information is mostly established by insights gathered during this field research (see chapter 3), and backed up by graduation theses of former graduate students of the Critical Alarms Lab.

figure 4 – The Adult ICU, unit C, of the Erasmus Medical Center. The patient rooms are situated on the right side, with bright sunlight; each room is closed from the corridor with a glass door. A nurse is sitting behind one of the nursing desks, with an intensivist standing behind her. Photo from: Critical Alarms Lab.

figure 5 – The sight of a patient, when lying in bed, into the corridor and nursing desk, which is partly covered with blinds. The photo is taken at the ICU of the HagaZiekenhuis.

figure 6 – The sight of a patient at the wall in front of him or her when lying bed. The green whiteboard is a means to let the family leave a message for the nurse about some personal facts of the patient. This photo is taken at the ICU of the HagaZiekenhuis.

figure 7 – An ICU nurse working in one of the patient rooms at the ICCU of the Erasmus Medical Center. He is preparing a room for the next patient coming in.

2.1 · DIFFERENT TYPES OF ICUS

In general, ICUs accommodate patients who need intensive monitoring, supporting, and/or take-over of one or more vital functions, but it depends on the 'complexity level' of the ICU how critically ill these patients are. Three different criticality levels are distinguishable: (1) non-complex patients who need, for example, a short period of mechanical ventilation, (2) low-complex patients who ask for 24/7 attendance of specialised physicians, and (3) high-complex patients who ask for 24/7 attendance of super-specialised physicians and who have several vital functions that are disturbed (Nederlandse Vereniging Internisten, 2012). For this project, level 3 ICUs with high-complex patients were taken into account.

Throughout the years, ICUs with dedicated specialisms made often place for a general Adult ICU (personal observation, December 3, 2018). For example, an ICU meant for neurosurgical, thoracic surgical or internal surgical patients were combined into one ICU accommodating patients with different diseases. Although hospitals with specialised ICUs still exist, the hospitals for this project mostly have a general Adult ICU, with an optional independent Cardiac ICU (Intensive Cardiac Care Unit, ICCU, in Dutch: 'hartbewaking') added to that. Patients might be admitted to the ICU unexpectedly or planned. In the latter case, the patient might have undergone surgery (for example lung transplantation). The ICCU admits patients with acute heart failures, vascular problems or planned heart surgery. Typical for this ICCU is the high rate of 'bed changes' during the day – most of the patients are there less than 24 hours. On the contrary, most Adult ICUs have to deal with 'langliggers' (in Dutch), meaning that patients are hospitalised for a long(er) period of time (for example two months) (personal observations, October 5, 2018).Though general Adult ICUs admit a varied patient population, the specialism of a hospital might still be of influence: a hospital could, for example, be focused on neurosurgery, and therefore mainly admit patients with these particular diseases (personal observations, December 3, 2018).

2.2 · ICU'S PHYSICAL ENVIRONMENT

2.2.1 OVERALL ARCHITECTURE

The overall architecture of an ICU differs per hospital, but the ICUs in this project have a couple of parts in common when looking at their layout. The observed ICUs all consist of a corridor (different in size) and a number of patients rooms with a door to that corridor (see figure 4). The amount of patient rooms, which are usually called 'boxes', varies: one observed ICU had a corridor with 6 rooms, whereas another ICU had 18 rooms in a row. Additionally, the department might contain just one corridor (one unit) or multiple ones with patient rooms (multiple units). Adjacent to every patient room is a nursing desk from where the nurse has a view on the patient lying in his or her room. Besides the corridor with patient rooms and nursing desks, an ICU department is often foreseen with office and lunch rooms, waste disposal rooms, sanitary facilities, stocks, kitchens, pharmacies/ labs and family (waiting) rooms. Depending on which rooms and facilities are there and in what amount, the one ICU is more self-sufficient than the other.

2.2.2 PATIENT ROOMS

All patients have a private patient room which can be closed from the corridor (and view outside) both visually and audibly (see figures 8 and 9). Blocking out sound coming from the corridor could be done by closing the door, giving the patient more rest

figure 8 – The patient room's windows can be blinded in order to provide privacy and rest for the patient. This photo is taken at the Adult ICU, unit C, of the Erasmus Medical Center.

and privacy (though he or she still hears the own machinery sounds). To blind the room, nurses need to cover the windows – most rooms are quite transparent by default (see figure 8). Blinding the patient room is again done to provide the patient with rest and privacy, for example when being washed, undertaking an intervention or when asleep.

Equipment in a patient room
Every patient room is equipped with medical equipment suitable for intensive care treatment and products for personal care (see figures 5, 6 and 7). The medical equipment consists of devices that are meant for monitoring, supporting or diagnosing (Salomé, 2018). Which devices are needed, and actually installed in the room, partly depends on a patient's condition. The products that are meant for personal care, such as a television, pin-up board with postcards or mood lightning, are mainly meant to inform and make the patient and family members at ease. Additionally, they might provide the nurse with some background information about the patient (see section 2.3.1). The products for personal care as well as the medical equipment enables the clinicians to care and cure a patient in his or her private room most of the time.

The bedside monitor in the patient room displays major bodily functions like heart rate, respiratory rate, blood pressure and temperature. What is measured and displayed is decided by the physician and nurse (Salomé, 2018). When a vital sign boundary exceeds, the monitor gives an audible (and visual) alarm. Each nurse sets these boundaries for his or her patient manually, so nurses have an influence on the number of alarms going off.

2.2.3 NURSING DESKS

Adjacent to each patient room is a nursing desk: a place from where the nurse can do administration on the computer while keeping an eye on the patient lying in the room and the monitor (see figure 9). These 'decentralised' nursing desks (in Dutch: 'nisje') are something of recent times: they replaced a big centralised nursing desk (in Dutch: 'zusterpost'). All observed ICUs made this transition sooner or later. In case of the centralised nursing desk, nurses monitored their patients from a central point in the corridor, with the patient rooms in sight and cameras in the rooms. Due to the nurses huddling together, the atmosphere felt sometimes like a 'cosy tea party'. In order to let the nurse focus more on the patient he or she is responsible for, the centralised nursing desk was replaced by multiple 'individual' desks. Though the desk might be shared with a colleague, who has to monitor the patient in the room next to it, the decentralised nursing desks force the nurses to work and monitor the patient in a more private space.

figure 9 – ICU nurses standing and sitting in one of the nursing desks at the ICCU of the Erasmus Medical Center. Both sitting nurses are working on the computer and using the PDMS in order to report their taken actions and the patient's status.

Every nursing desk is also foreseen with a split 'bedside' monitor. This monitor shows all the vital signs of four patients next to each other. The alarm can be paused through the monitor directly. So, besides keeping an eye on the patient through the window, nurses can monitor their patient also through the split bedside monitor when sitting at the nursing desk.

Equipment at a nursing desk
The decentralised nursing desks are provided with a computer for doing work- and private-related tasks. Work-related tasks on the computer usually entail working with the patient data management system (PDMS), which can also be done at the computer in the patient room. The PDMS documents "important measurements of the patient's bodily functions and bundles logs written by the ICU team, treatment goals, planning and checklists" (Salomé, 2018). Besides consulting the PDMS, work-related tasks are, for example, mailing, consulting information on the internet, and e-learning. Using the computer for private-related activities entails, for example, watching videos and using social media. Usually, the nurse can use the computer that is right next to the patient room, but it happens that a colleague takes the spot for doing a quick task.

2.3 · PEOPLE PRESENT IN THE ICU

The ICU is a technologically advanced environment which accommodates people with rather different intentions and needs. First of all, it accommodates the patients who undergo treatment and who need physical and mental comfort in order to recover. The patients are visited and mentally supported by their family members and friends, who all need to be informed and emotionally supported by the nurses, physicians and other medical support members. Besides informing and supporting, the clinicians, of course, need to cure and care the patient. Lastly, the ICU accommodates the non-clinical staff members who have less direct contact with the patient, such as the head of the ICU, cleaners or technicians. So, all in all, the ICU is a dynamic working and healing environment.
See figure 12 for an overview of the people being present in the ICU and their role towards the patient and each other at the end of this chapter. More information about the patient (and family) and nurse, and the interactions between them, is given in the next section.

Accessibility of the department
Besides accommodating many different people, ICUs have a dynamic atmosphere due to all the people being free to walk in and out of the corridor to a greater or lesser extent. It differs per hospital how accessible the department is: the one ICU has a lock on every door, whereas the other ICU has a lock to a couple of rooms only. Employees of a hospital have easy access through an identification badge, though family members rely on the nurses or voluntary hosts at the reception counter.

A family member's access is also restricted due to rules and regulations, such as a particular amount of visitors in the patient room and visiting hours. Nurses play an important role in guarding these rules and regulations and keeping it ‘quiet’ in the patient room, though many nurses express that the dynamic nature is part of the ICU environment.

2.3.1 INTERACTION BETWEEN NURSE AND PATIENT (AND FAMILY)

Patients are treated and cared for by a team of clinicians, but the nurse is the one who is ‘closest’ to the patient. In most cases, one nurse is responsible for one patient. Nurses are continuously monitoring the patient and acting upon the medical treatment plan that is set up by the physicians mainly. Additionally, nurses have to update the team about the patient's status, and the patient and family about the recovery process and the medical decisions. Therefore, nurses see themselves as the ‘advocate, representative or spokesperson of the patient' in relation to other clinicians such as intensivists or physiotherapists. The nurses ensure that the patient's individual values and needs, or those of the family, are complied with as much as possible. So, nurses have a pivotal role in caring and curing patients. Besides continuously monitoring the patient and providing critical care, nurses are highly involved in making it the patient (and family members) mentally and physically comfortable; in other words: providing personal care. Nurses do so in consultation with the patient and family when the patient is non-sedated (by using oral communication, or hand or eye gestures when the patient is not able to talk), for example about how the patient wants to be shaved, combed or laid in bed. When a patient is sedated or cannot communicate due to something else, family members are even more important for nurses to get to know 'the person behind the patient'. Nurses can, for example, attune their tone of voice and the way of addressing the patient in order to act in line with a patient's (or families') values and needs. This way, they try to make the hospitalization, mostly experienced as a stressful and uncertain time, as comfortable as possible.

Interpreting the patient's status through different signals
Nurses can consult various sources in order to be aware of their patients' status. Examples of these sources are the patient data management system (PDMS) that shows the history of a patient's status, a colleague who monitored that same patient before and who can provide some additional remarks, the sight of a patient which tells something about how he or she is feeling, or the bedside monitor that shows current movements in the vital signs. With the alarms from the medical equipment added to that, a nurse is continuously exposed to signals with which he or she can interpret the current and future status of his or her own patient (or those of colleagues) and decide which actions need to be taken.

Some ICU nurses specifically like their job due to the monitoring devices that enable them to care and cure the patients more efficiently than at the normal care department. Taken medical actions might be visible in the body's vitals immediately and changes in a patient's status might be noticed earlier. However, due to the excessive amount of (simultaneous) alarms, many nurses develop a love-hate relationship with the medical devices, patient monitor and/or pager. On the one hand, nurses rely on all the devices (and their alarms), but on the other hand, they could make it the nurse hard to cope with situations in which many, puzzling alarms are ringing.

2.3.2 PAGER NOTIFICATION SYSTEM

Some ICUs make use of a pager notification system, giving nurses the ability to receive alarms on a personal portable device. A pager looks like a mobile device and is linked to a particular patient room: at the beginning of a shift, the nurse takes the pager of the patient he or she is responsible for. A pager gives an audible and/or haptic notification when an alarm is going off at another medical device or when a patient or colleague asks for assistance. When a nurse pauses or dismisses the notification on the pager without taking any further actions (for example, pausing the alarm on the monitor or actually solving the problem), the alarm is sent to the pagers of colleagues that are linked to it. In some ICUs, the pager is only linked to a couple of rooms (and when these colleagues do not react, the notification goes to the whole nursing team) but in other ICUs, the pager is immediately linked to all rooms. This can lead to situations in which the nurse receives too many signals upon which he or she can act, leading to continuously pausing the alarms on the pager.

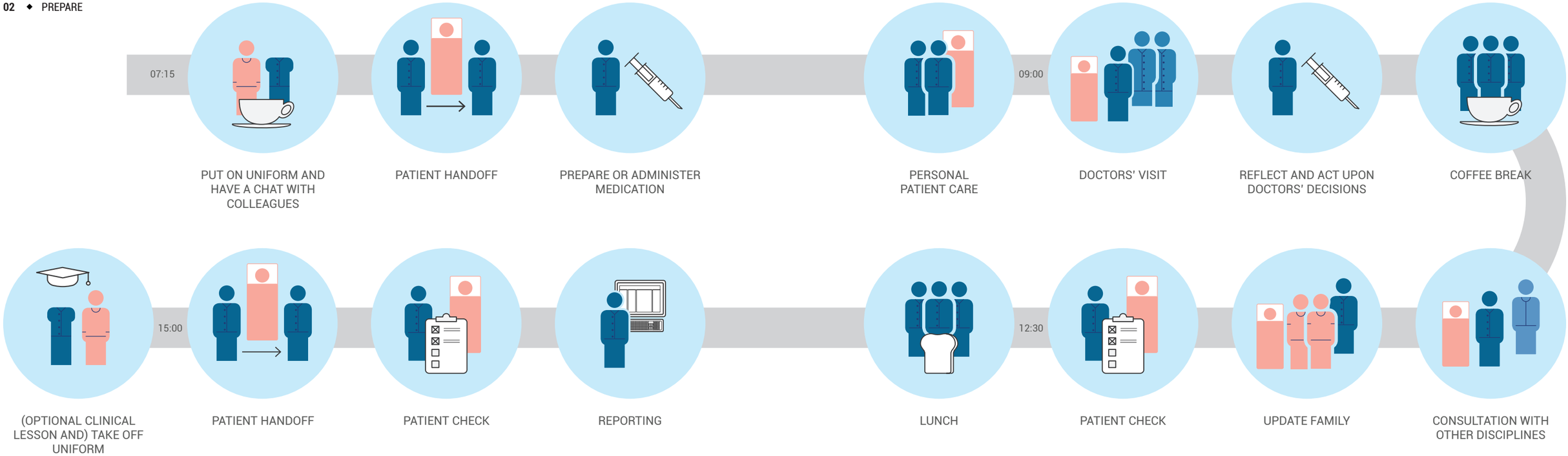


figure 10 – Overview of how a day shift of an ICU nurse could look like. The time stamps are an indication. As said, the ICU is a dynamic working environment, so the schedule could be different. The image is based upon own observations as well as the insights gathered by Salomé (2018) and Bogers (2018).

2.4 · WORKFLOW: HOW A DAY SHIFT LOOKS LIKE

A whole day is divided into three different work shifts for ICU nurses: a day shift, evening shift and night shift. Shift take-overs take place around 7.30 AM, 3 PM and 11.30 PM. Twelve hours shifts are coming into existence as well (personal observation, December 4, 2018). ICU nurses show a routine in the activities they undertake during a day shift (see figure 10), but the flow of these activities is not written in concrete. The dynamic nature of the ICU asks the nurses to be flexible and adaptable to the circumstances. Nurses perceive the ICU as more busy and dynamic during a day shift than during a night shift. Therefore, some nurses might prefer to work either in the night or during the day.

2.5 · SOUND SOURCES IN THE ICU

As said in the Introduction, former Critical Alarms Lab graduate student Redert (2018) found four different sound sources in an ICU that transformed the ICU in an acoustically hostile environment (see figure 11). First of all, the medical devices, monitors, and, if applicable, pagers send many audible alarms, which could be directed to the nurse directly or exposed in the more 'open' air of the corridor. Secondly, clinicians and other non-clinical staff members converse with each other as well as with the patient and family members. Thirdly, sounds might be produced by incidental events such as a medication scanner falling to the ground or a lid clattering onto the dustbin. Fourthly, people present in the ICU are exposed to background sounds that are, for example, inherent in the medical machinery, such as the sounds of a mechanical ventilator or pressure mattress. Redert (2018) argued that the first three sound sources (i.e. alarms, speech and incidental sounds) are highly induced by one's behaviour. So, actually, nurses might have a contribution to the acoustically hostile environment. How the nurses' practices are of influence on the sound environment (and vice versa), is the subject of investigation in the next chapter.

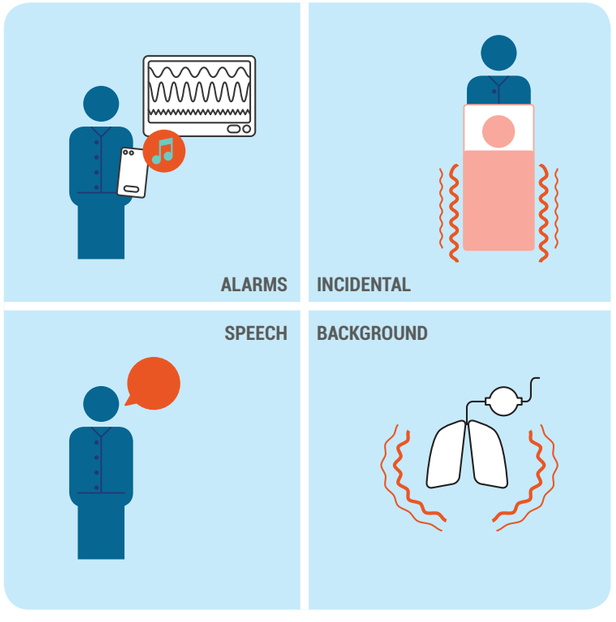
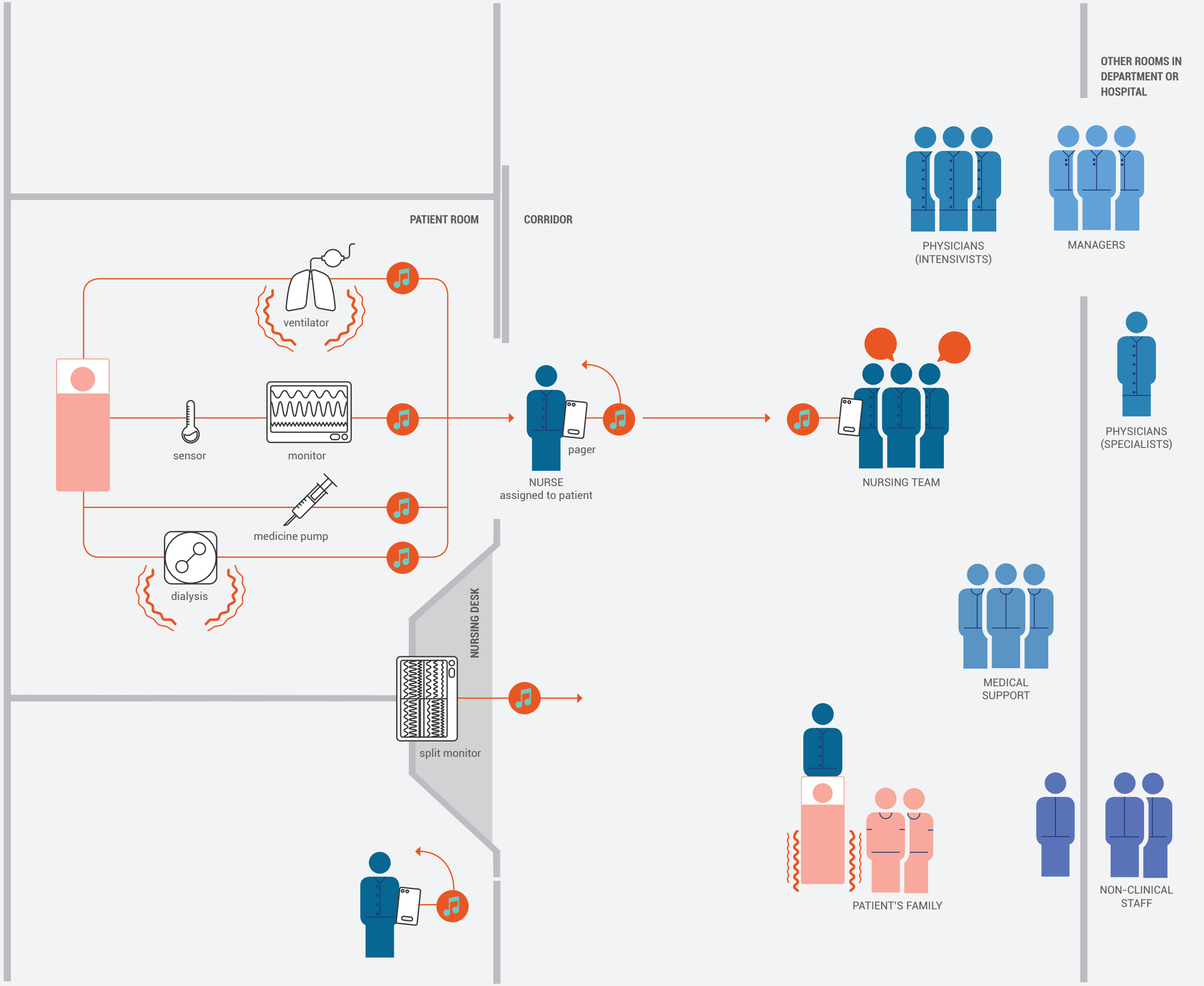


figure 11 – Overview of the sound sources in the ICU, found by Redert (2018). Nurses are involved in the production of alarms, speech and incidental sounds.

figure 12 – (see next page) Overview of the people being present in the ICU and the ICU's physical environment. The patient is hospitalized in the patient room and surrounded by the medical machinery and their alarms. The responsible nurse receives these alarms (orange lines), from the devices themselves, monitor and/or pager. Other colleagues might receive the alarms as well, due to the sounds being transmitted into the corridor, but also from the monitor in the corridor or via their pager.



CLINICIANS

PHYSICIANS
Determine treatment, diagnose and cure the patient. The physicians are most powerful in terms of taking decisions in a patient's medical treatment.

Intensivists, specialists (e.g. neurosurgeon), fellows, physician assistants, doctors assistants)

NURSING TEAM
Execute treatment, care, represent the patient and advise physicians. Nurses are involved in discussions about the treatment plan, yet they cannot do more than taking an advisory and criticizing role towards the physicians.

Nurses, research nurses, nurse practitioners, nurses in training, nursing team leads

MEDICAL SUPPORT
Investigate and support treatment of patient, and advise physicians and nurses.

Physiotherapists, dieticians, psychologists, radiologists, etc.

NON-CLINICAL STAFF MEMBERS
No provision of any medical treatment or testing. They do not have face-to-face-contact with patient.

Management, Secretary, Logistics (services: care assistants (who supply stocks), technicians, cleaners), Reception (voluntary hosts)

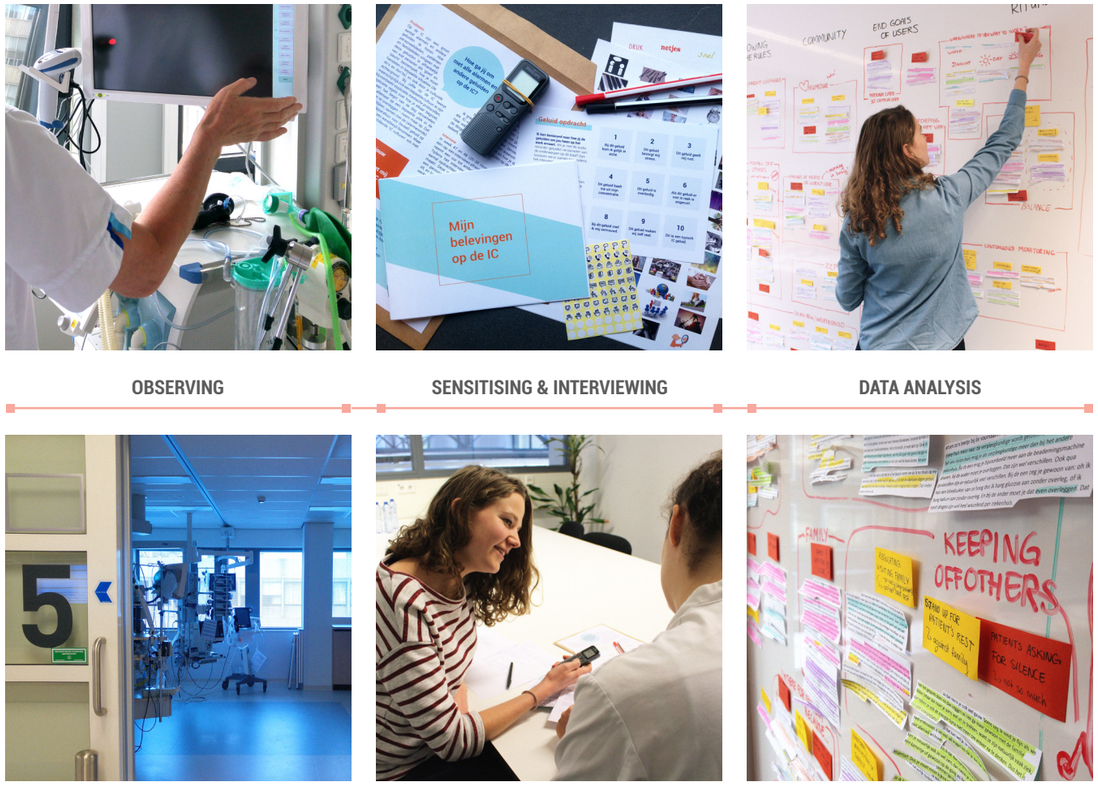
PATIENT'S FAMILY
Represent patient, especially when patient is sedated. They have restricted access to the ICU due to rules and regulations (e.g. visiting hours, number of people present in the room).

One or two of the family members is the contact person for the nurse

03

FIELD RESEARCH

After the more general information about the context of an intensive care unit (ICU), this chapter describes how the 'ICU sound cultures' could be typified, involving ICU nurses' (sound-related) core values and how uniform they are in practising these values. This understanding is captured during a procedure based on contextmapping, which is an "intensive research activity" that enables users to "express deeper levels of knowledge about their experiences" (Sleeswijk Visser, Stappers, van der Lugt, & Sanders, 2005). Data is collected through observations in six different Dutch ICUs, and sensitizing and interviewing a varied selection of nine ICU nurses. These activities resulted in a rich data set, revealing what ICU nurses do, say and how they behave but also what they "know, feel and dream of" (cited in Visser, Stappers, van der Lugt, & Sanders, 2005). By analysing this data set on the wall, (sound-related) behavioural patterns and underlying values among the ICU nurses were discovered. This chapter shows the results of the 'analysis-on the-wall' as well as the procedure to get there. It will be closed with a reflection on the research questions.



OBSERVING | SENSITISING & INTERVIEWING | DATA ANALYSIS

figure 13 – Photos of the taken steps in order to get to know the ICU nurses and the ICU sound culture. During the observations, sensitizing and interviews, the nurses were the centre of attention The data analysis was done by myself.

3.1 · METHOD

Six different ICUs and a varied selection of nine ICU nurses were the subjects of investigation during a period of observing, sensitizing and interviewing (figure 13 shows a visual impression of the procedure). The following subsections describe how these activities were executed (e.g. which tools are used), with whom (i.e. the participants), and what kind of data was collected in the end. The last section describes how this data was analysed, during and after the period of observing, sensitizing and interviewing.

3.1.1 ACTIVITIES

Observing

In order to get an impression of the ICU's physical environment and the nurses' activities, I observed six different ICUs throughout the Netherlands within a timespan of 2 months.

In the beginning, a more unstructured observational approach was applied. The Adult ICU of the Erasmus Medical Center in Rotterdam (see table 1) served as a starting point. Although I entered this ICU with some general thoughts on what might be striking with regards to the sound problem in the environment, the adopted scope was very wide: I ensured myself to observe, both with eyes and ears, the way "people move, dress, interact and use space" (Mulhall, 2003). After visiting multiple ICUs, the observational approach became more focused. The relative extensive observations in the first observed ICUs created a frame of reference, making it easier to discover the similarities and differences with other ICUs.

Observational roles

Six different ICUs were observed, from all the four observational roles described by Mulhall (2003): as a complete observer, observer as participant, participant as observer, and complete participant (see figure 14).

The changing of roles happened for these reasons:

- ◊ a specific role was chosen consciously by me or the contact person of the ICU;
- ◊ the circumstances on the work floor, such as unexpected critical events, forced me to take distance from the medical activities;
- ◊ the (intrinsic) willingness of the nurses to involve me in or talk me through their activities;
- ◊ wearing a medical uniform myself, so that nurses considered me as one of them.

Complete observer and observer as participants

The role of a complete observer was mostly carried out by being a 'fly on the wall' (Van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2014): I sat at an unoccupied nursing desk, while keeping my distance, and wrote down field notes of what happened. The role of an observer as participant made me switch between observing as a 'fly on the wall' and asking the nurses to clarify the events. Being an observer as participant still gave the opportunity to see and hear the nurses in their natural working environment, but, compared to the role of a complete observer, it was easier to understand what the nurses were actually doing and why (Mulhall, 2003).

Participant as observer and complete participant

The role of a participant as observer is mostly carried out by shadowing a nurse for (part of) a day shift (Mulhall, 2003). Compared to the previous roles, this role enabled me to better empathize with the nurse: I built a relationship with the nurse and I partook in most of his or her activities, including those in the patient rooms. Additionally, the role enabled me to get a complete picture of the nurse's workflow. A pitfall of partaking in the nurse's activities, as well as wearing a medical uniform, is that some staff members, who were not aware of my presence that day, did not perceive me as a researcher. In this way, I became more of a complete participant accidently (Mulhall, 2003).

figure 14 – The taken observational roles when visiting the ICUs. The roles enabled me to 'blend' into the context to a greater or lesser extent. (infographic is inspired by Sauro (2015).

Sensitizing

A varied selection of nine ICU nurses shared their subjective experiences in a personal sensitizing package (see figure 13: upper middle picture), which served as a means to prepare them for the one-on-one interview. The package was given to the participants with a minimum of one week prior to the interview, and the most important contents were a diary and additional sound exercise with a voice recorder. The process of making the exercises is called sensitizing, wherein "participants are triggered, encouraged and motivated to think, reflect, wonder and explore aspects of their personal context in their own time and environment" (Sleeswijk Visser et al., 2005). The sensitization helped the nurses in sharing their experiences during the interview and deeper levels of knowledge could be reached (Sleeswijk Visser et al., 2005).

Diary

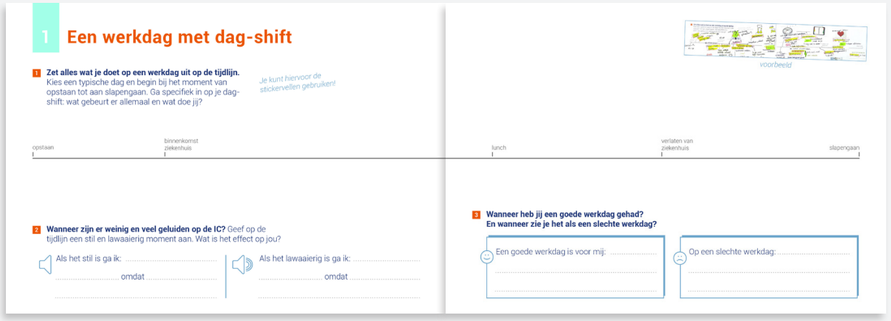
The personal diary consisted of five small exercises, with an additional introductory and closing exercise (see figure 15). Each exercise covered a cultural aspect(s) described by Hao et al. (2017) and addressed aspects of the sound problem. The nine participants were advised to do an exercise each day "to slowly become aware of their experiences" (Sleeswijk Visser et al., 2005)

Sound exercise

Besides the diary that served as a means to let the participant "continually think about the subject" (Sleeswijk Visser et al., 2005), the package contained an additional sound exercise that could be done throughout the whole timespan of a week (see figure 16). The participant's task was to record sounds that gave him or her one or more of the pre-set feelings, shown on a separate paper, during work.

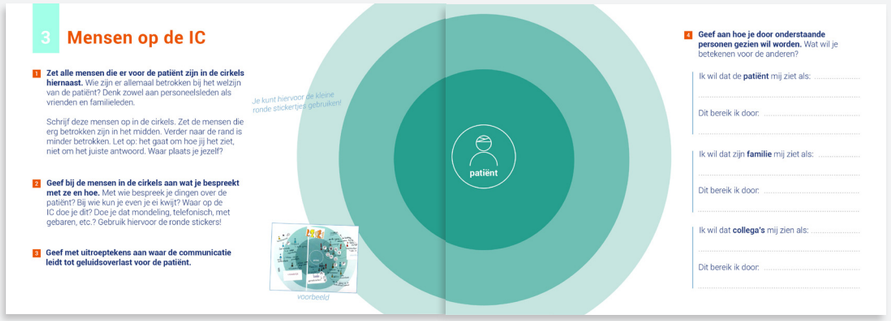
Interviewing

The executed exercises in the sensitizing package served as starting points for a one-on-one depth-interview that lasted for around one hour; before, during or after the participant's night, day or evening work shift. By continuously asking the participant 'why?' and 'how?', I moved up and down the different levels of the abstraction hierarchy (see the questionnaire in appendix D). In this way, the values behind the participant's practices and vice versa could be discovered (Sanders & Stappers, 2012). Besides exploring the participant's personal experiences, the participant had to reflect upon values and practices of colleagues as well as ICU nurses in general. Therefore, stories that describe the values and practices on an individual, group and universal level were collected (Van Boeijen, 2011).



Exercise 1 makes the participant aware of his or her daily activities and what he or she strives for. This will give insights in the cultural aspects 'Rituals in everyday life' and 'Goals of end users'. The exercise prepares the participant for the second exercise too.

Exercise 2 is highly related to the sound problem and cultural aspect 'The Material World'. It makes the participant not only reflect on the surrounding sound sources, but also on other signals that might be too little, balanced, or too much for him or her.



Exercise 3 concerns the cultural aspects 'Community', 'Division of roles' and 'Goals of end users'. The participant should think about the ICU team and his or her personal role and goals.

With exercise 4, the participant explores the topic of 'patient wellbeing' and that of the participant him- or herself. The aim is to make the participant reflect on important things in work that might produce sounds, and how this could be changed or not.

Exercise 5 covers the phases of the 'Path of Expression', a process in which the participant could share his current, past and future thoughts and feelings (Sanders & Stappers, 2012). The questions cover multiple cultural aspects, among other things the aspect 'Macro developments'.

figure 15 – The five main exercises of the sensitizing diary booklet. The first observational insights gathered at Erasmus Medical Center's ICUs served as input for the development of the exercises. This is in line with the suggestion of Corbin & Strauss (1990): "start with the analysis as soon as the first bits of data are gathered so that it can steer the next activities for data collection".

figure 16 – The sound exercise with ten particular tasks: the participant had to record sounds that can be placed in one of these pre-set feelings. The exercise and the physical voice recorder should make the participant extra sensitive to the ICU's sound environment.

3.1.2 PARTICIPANTS

The nine interviewed ICU nurses came from six different ICUs: two ICUs at the Erasmus Medical Center (Rotterdam), one ICU at the HagaZiekenhuis (The Hague), and three anonymous ICUs (called participant 4, 5 and 6). As said, all ICUs were also observed for a certain period of time and from a certain observational role. See table 1 for more information about the participating ICUs and nurses.

The group of participants varied in age and work experience. In general, three groups could be distinguished: low, middle and high experienced ICU nurses. This division was based on the participant's 'factual' years of work experience and his or her 'perceived' work experience, which was discussed during the interview. The distribution of the nine participants among the three groups was as follows:

- Low: 2 nurses with less than 2 years of work experience, with one of them still in training (age: mid-twenties)
- Middle: 3 nurses with 5 to 15 years of work experience (age: end-twenties – end-thirties)
- High: 5 nurses with more than 20 years of work experience (age: mid-fifties)

Except for the criteria of the level of work experience, I had little influence on the recruitment: the nine participants were mostly recruited by a clinician of that particular ICU.
Two ICUs were regarded as 'outliers': Erasmus Medical Center's Adult ICU/Cardiac (ICCU) and Participant 4 and 5. The patient population at the Erasmus Medical Center's Adult ICCU differs from the other ICUs: it mainly hospitalises patients with acute heart issues and patients who need to be monitored after heart and/or lung surgery (see section 2.1 for more information about an ICCU). Participant 5 consists of fewer patient rooms compared to the other ICUs: it just consists of 6 single beds. The limited number of patients and the smaller team of clinicians might influence the nurses' perceived business, work pressure and team dynamics (personal observation, December 4, 2018). Next to that, this ICU, as well as the ICU of participant 4, does not have a pager notification system. The two outliers were helpful for pinpointing typical aspects of each ICU.

3.1.3 DATA COLLECTION

Observations in different ICUs and sensitizing and interviewing a variety of ICU nurses resulted in a rich data set, varying from more objective to more subjective data. The raw data set consists of (see figure 17):

- observation notes (taken by researcher);
- photos (taken by researcher);
- diary booklets (filled in by participants);
- ICU sound recordings (recorded by participants);
- interview transcripts (generated by researcher).

table 1 – Overview of the participating Dutch ICUs and interviewees. Since the project was partly in collaboration with the Erasmus Medical Center, most interviewees came from this hospital. The size (i.e. the number of beds and team members) and the patient population differed per ICU.

name of hospital / characteristics	ERASMUS MEDICAL CENTER (EMC) ROTTERDAM)	ERASMUS MEDICAL CENTER (EMC) ROTTERDAM)	HAGAZIEKENHUIS THE HAGUE	PARTICIPANT 4	PARTICIPANT 5	PARTICIPANT 6
ICU type	Adult ICU / General	Adult ICU / Cardiac (ICCU)	Adult ICU (+ MC)	Adult ICU (+ MC)	Adult ICU	Adult ICU
Beds	38	14-16 in use (out of 17 + 1 child room)	18 in use (out of 24)	24 in use (out of 26) (+ 10 MC beds)	4 in use + 2 recovery beds in the evening/ night/weekend	36
Team size - Day	n.a.	10 ICU nurses	10-12 ICU nurses + 4-5 physicians, + 4-6 other (medical support)	18 ICU nurses (+ 6 MC nurses)	3 ICU nurses	n.a.
Team size - Night		8 ICU nurses	9-10 ICU nurses + 3 physicians		3 ICU nurses	
Level of IC	Level 3	Level 3	Level 3	Level 3	Level 3	Level 3
Layout	4 units	1 hallway	2 units (+ 1 room for 6 patients after heart surgery + 1 room for 4 MC patients)	2 units (+ 5 MC twin room)	1 hallway	3 units
Patient population	General	Thoracic surgical and cardiological	General (30% after heart surgery)	General (a lot of thoracic surgical; no neurosurgical)	General (no thoracic surgical and cardiology)	n.a.
Observations	2	1	1	½	½	¼
Observational role	Complete observer & (Observer as) participant	Participant as observer	Observer as participant	Complete observer (Observer as participant)	Observer as participant	Complete observer
Interviewees	3	2	1	2		1
Interviewee 1 characteristics	Male 1 - aged 57 ICU nurse since 1998 - always EMC	Female 2 - aged 54 - ICU nurse since 1991 - 1 year at EMC	Female 4 - aged 29 - ICU nurse since n.a. - 10 years at HAGA	Female 5 - aged 54 - ICU nurse since 1997 - 9 years at hospital	See nurses at participant 4	Female 7 - aged 54 - ICU nurse since 1993 - Flex, 3 years at current hospital
Interviewee 2 characteristics	Male 2 - aged 24 ICU nurse since 2017 - in training, 4 years working at EMC	Female 3, aged 27 - ICU nurse since 2017 - 6 years at EMC		Female 6, aged 53 - IC-nurse since 1995		
Interviewee 3 characteristics	Female 1 - age n.a. - ICU nurse since 2007 - always EMC					

Observation notes
During the observations in six different ICUs, I continuously took notes of observable sound-related events, though other contextual factors were of interest as well. Emotion Capture Cards (Ozkaramanli, Fokkinga, Desmet, Balkan, & George, 2013) helped in structuring these notes: the cards show the interrelations between stimulus events that happen in the world, and a user's emotions and concerns relating to those events (see appendix E). If the situation occurred, the nurses were asked to share their subjective experiences about an event. While doing so, the nurses expressed their concerns literally or I interpreted them on the spot. All in all, the notetaking led to a booklet full of descriptions of sound-related events taking place in the ICU.

Photos
To be able to show the nurses' practices from a 'material cultural' perspective, I took photos of the ICU's physical environment during the observations. Since the ICU is a privacy-sensitive environment, particular situations or places were difficult to capture. However, the process of making photos still helped me in taking a 'material cultural' lens and to focus on how the physical environment shapes the nurses' behaviour and vice versa.

Diary booklets
All participants went through the diary booklet in the week prior to the interview by filling in the questions – the one participant more thoroughly and completely than the other. Besides the booklet being a preparation and guide for the interview – interviews with participants who had put much effort to it were indeed more in-depth – the booklets were also consulted during the analysis phase.

ICU sound recordings
When a participant executed the separate sound exercise, we listened back to the recorded sounds and evaluated them during the interview. In case of participants who did not record sounds (due to a variety of reasons), they thought of sounds they would like to capture. So, also without the actual sound recordings, the exercise was still appropriate for getting an impression of how the participants experience the sounds they are surrounded with and the actions they take.

Interview transcripts
The voice-recorded one-on-one interviews were transcribed word-for-word in order to transform the conversation into data that could be easily accessed and interpreted. The transcribing process avoided losing meaningful data, which might be the case with interpreting the conversation on the spot and preselecting parts of the audio tape to listen back to. By reading the transcript, the step of selecting and interpreting the data could be done in peace and without preliminary judgements (Seidman, 2006).

Though Seidman (2006) recommends adding all the nonverbal signs to the transcription as well, the nonverbal signs were left out. Doing so saved time – transcribing is already a time-consuming process – and the transcriptions were only used by myself. I heard their voice in my head while reading, so I could easily imagine how words and sentences were punctuated.

3.1.4 DATA ANALYSIS

The qualitative data set served as input for an on-the-wall-analysis phase in which different levels of sense-making occurred (Sanders & Stappers, 2012). These levels of sense-making were based on Ackoff's (1989) DIKW scheme and guided the analysis on the level of data, information, knowledge, or wisdom (Sanders & Stappers, 2012). See figure 17 for an overview of the analysis approach.

All data sources were taken to the analysis phase, though some were more intensively used than others. The interview transcripts served as the main input for the analysis on the levels of information and knowledge. The observations notes, photos and ICU sound recordings helped in making sense of the stories of the interview participants when they described situations involving certain places, devices or sounds. The filled-in diaries mainly served as reference work: they helped in typifying each participant later on. By using different data sources, "more dependable insights could be constructed", which is called 'data triangulation' (Stappers, 2012).

Analysis on the level of data

The analysis started as soon as the first data collection activity was done: observations in the Adult ICU at the Erasmus Medical Center in Rotterdam (see table 1). In line with the Grounded Theory approach, in which Corbin & Strauss (1990) recommend to start the analysis as soon as the first data is gathered so that it can "direct the next interview and observations", I continuously reflected upon every observation and interview. Therefore, preliminary generated insights influenced the next data collection activities. Additionally, during notetaking, the researcher is actually already 'analysing' the phenomena around him or her: things deemed important are transformed into data, in this case: observation notes (Sanders & Stappers, 2012). The continuous process of data analysis, on the spot and throughout the different data collection activities, resulted in a rich data set (see previous section).

Analysis on the level of information

At the level of information, the interview transcripts were read through and interesting quotes were selected by interpreting the quotes and assigning meaning to them (Sanders & Stappers, 2012). This process of selecting quotes and sense-making was guided by the nine cultural aspects described by Hao et al. (2017) (see appendix C). The quotes were marked with a colour corresponding the participant, cut out and stuck onto one of these nine cultural aspects that were tagged onto two whiteboard walls (see figure 13: two pictures at the right).

Though the analysis began with pre-set 'cultural aspect categories', the further phases of the analysis were in line with the Grounded Theory approach (Corbin & Strauss, 1990), in which "data is studied to discover structures without using pre-set expectations of the data" (Sleeswijk Visser et al., 2005). While selecting quotes and categorizing them in a certain cultural aspect, sub-themes and patterns emerged simultaneously. As suggested by Sleeswijk Visser et al. (2005), notes on small stationary post-it notes were added to the sub-themes. This facilitated faster allocation and rearrangement of quotes. The spacious whiteboards and being "physically surrounded with" all the data (later on, the photos taken during the observations were also added) enabled me to allocate and rearrange them freely. Additionally, it "supports creating overviews and may show the relations between different experiences and themes visually" (Sleeswijk Visser et al., 2005). All in all, the semi-structured process of analysing on the level of information resulted in two whiteboard walls filled with categorized interview quotes and meaningful (sound-related) topics and themes.

Analysis on the level of knowledge

At the level of knowledge, all the information on the two whiteboard walls was brought to a higher abstraction level. This process was guided by five sociocultural dimensions that I deemed meaningful in the context of an ICU (Van Boeijen, 2011) (see appendix B). The interview quotes, themes and topics on the walls were linked to one or more sociocultural dimensions. This process helped in discovering the nurses' core values, their value orientations, and how these are manifested

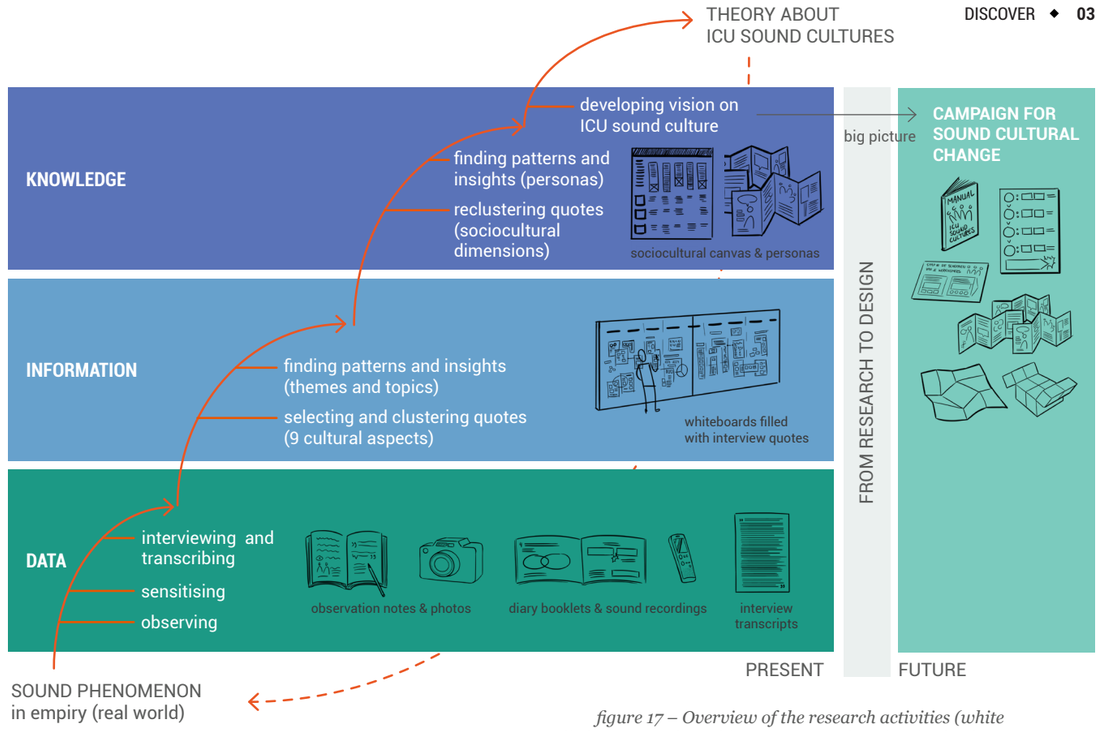


figure 17 – Overview of the research activities (white little texts) and resulting outcomes (drawings). The three horizontal bars above each other show the levels of sense-making. The bridge from research to design took place on the level of knowledge. The campaign shows a bigger picture, a vision on the future desired ICU sound culture (infographic is based upon Sanders & Stappers (2012)).

through the nurses' practices. Moreover, different types of ICU nurses showed up in tandem (see section 3.2.2). All in all, the analysis on the level of knowledge – that moved from the wall to an Excel sheet on the computer – made the insights more generalizable, meaning that they can "predict further events that are not yet seen" (Sanders & Stappers, 2012).

3.2 · RESULTS

Due to the analysis at different levels of sense-making, multiple physical communication means that could be used as a standalone or together were obtained and developed. The most important means and results are described in the next subsections: the sociocultural canvasses, the three personas and the core values they share. The results form a bridge towards typifying the different ICU sound cultures and defining how designers could influence this, which is described in the Discussion section at the end of this chapter.

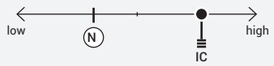
3.2.1 SOCIOCULTURAL CANVAS

As suggested by Sanders & Stappers (2012), the findings of the analysis on the level of knowledge were translated into communication means by "using quotes (data), interpretations of the quotes (information) as well as the general rules that are operating in the given situation (knowledge)". This resulted in, among other things, an A1-sized canvas (see figure 18). The canvas shows practices, individual experiences, and needs that are related to a particular value orientation on a sociocultural dimension that I deemed important for typifying (sound) cultures in the ICU: hierarchy, identification, space, self-expression or attitude (Van Boeijen, 2011).

Figure 18 shows the canvas about the sociocultural dimension 'hierarchy'. Part of the content for the canvasses about the other four sociocultural dimensions can be found in appendix F. Due to time constraints, the content was not translated into the canvas templates. However, generating the content helped in making sense of the data on a knowledge level and to reflect upon the research questions in the end.

HIERARCHY

1



When looking at all the people present in the ICU (such as the physicians, specialists, nurses physiotherapists, cleaners, and family members), the notion of hierarchy is high. There is, for example, a clear division of roles, with the one more powerful in taking and executing medical decisions than the other. The people present in the ICU all play a different role when it comes to caring and curing the patient.
When looking at the nursing team, the notion of hierarchy seem lower. Though age and experience influences how nurses interact with each other, every nurse is respected and responsible for a particular patient.

2

A UNIFORM MAKES THE TEAM

The medical staff members have a clear profession and they know their role in the team. Each profession is to a greater or lesser extent visible when looking at their uniforms. Teams with the same profession (e.g. the nursing team) have more or less the same uniform; one can pick, for example, a ladies sized or unisex uniform. But between the teams (e.g. the nursing team versus the physicians' team), differences are noticeable to a greater or lesser extent. The biggest difference between nurses and physicians in all ICUs is the length of the coat: nurses wear one to the hips, and physicians wear one between hips and knees.

THE POWER OF A PHYSICIAN

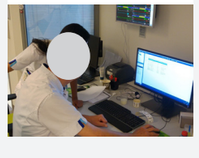
The physicians (e.g. intensivists) are most powerful in terms of taking decisions in a patient's medical treatment. Nurses are involved in discussions about the treatment plan, yet they can't do more than taking an advisory and criticizing role. The one nurse is more powerful in doing so than the other, which mostly depends on one's experience and reputation in the team.
Some nurses indicated that the atmosphere in the department sometimes loosens up when physicians are not present. Nurses might become more chatty, group together and have breaks in the hallway, meaning that the sound level increases.
The change of atmosphere and behaviour indicates that physicians are not only powerful in a patient's medical treatment, but also radiate a certain power in general.

50/50 INDIVIDUAL & TOGETHER

To what extent the nurse can execute tasks on his own, without someone else's intervention, exists in relation to both the physicians as well as in the nursing team. This autonomy differs per ICU: some tasks may only be executed by the physician for example, whilst in the other ICU it could be done by the nurse. Autonomy in relation to the nursing team is visible in to what extent nurses need to double check each other's actions (e.g. when administering heavy medication) and to act in concert.
Nurses in training grow in responsibility throughout their education. This ranges from shadowing a 'trained' nurse to being responsible for an own patient with support of the 'trained' nurse.

AGE AND EXPERIENCE DO MATTER

Every 'trained' nurse is regarded as capable of taking responsibility for caring and curing a patient, so in that sense there seems to be a low hierarchy. However, a division between the younger, less experienced and older, more experienced nurses is noticable. Many of the latter are aware of their role in the team, their reputation and experiences – they use it wisely in their communication to other team members. Older, experienced nurses pass on their beliefs and (medical) habits to the younger, less experienced nurses. Some do this in a teaching and intrusive way. Others do this in a more helpful way; they let the younger ones think more for themselves. They believe it will become allright in the future. This might be explained by the fact that many nurses indicate that you learn by doing and that you grow by experience. Additionally, many nurses are aware of their past behaviour as a young nurse themselves. The experienced nurses could inspire the younger ones and nurses in training, and vice versa.



NURSES WITH SPECIAL DUTIES

A nursing team contains specific roles. It differs per ICU if these roles exist. Roles one could think of are: 'captain of the day' (in ICU language: stip, streep), a 'vliegende keep' (in ICU language: 'omloop') and an 'acute situation nurse'. Additionally, there are nurses who have a controlling function (e.g. about the decubitus prevention) and/ or more of an organisational function (e.g. a scheduler).

(DEPENDANT) FLEX WORKERS

Flex workers are a growing group in the clinicians team.
A flex worker's presence in the ICU varies a lot. He or she might be there on a regular basis for a longer period of time or just for a couple of days.
A flex worker executes the same activities, yet he or she is sometimes more dependent on other colleagues.
Especially in the beginning, flex workers need to get to know the manners and the medical protocols. This is mostly learned by doing and asking colleagues about things that the flex worker has doubts about. Another dependance factor is the lack of an identification badge - a situation that sometimes occurs when being there for a short period of time - because it might obstruct access throughout the department as well as administration in the computer.

FAMILY HAS LEAST TO DEMAND

Though nurses see the importance of supporting family members because of the impactful hospitalization, family members can also be seen as an 'obstacle' and be treated as the ones that have the least to demand. They do not always stick to the number of visitors that is allowed (mostly two at the same time), are sometimes waiting and grouping together outside the patient room, and their visiting timing is not always right. Therefore, nurses ask them to wait in the family waiting room.

3

OPINIATED PROFESSIONAL
AUTONOMY
IMPACT
COMPETENCE

ASSERTIVE ALLY
MORALITY
PURPOSE
ORDER

DOCILE NOVICE
ACKNOWLEDGEMENT
BELONGING
COMPETENCE

4

I know how to be not of influence
"Ik ben het niet altijd eens met de keuzes van de dokters. Soms zijn ze duidelijk: 'zo gaan we het doen en je moet er verder van afblijven.' Dan moet je weten wat je laat."

I can do it myself
"Ik probeer zoveel mogelijk zelf te regelen. Je moet de dokters alleen lastig vallen met de dingen waar je niet uitkomt. Die gevaarlijk zijn, dingen waar zij voor zijn."

I feel my power grow
"Ik merk echt, van de laatste tien jaar, dat als ik zeg dat er gezeik is en iemand moet komen, dat er dan gelijk iemand komt. Er is nooit discussie."

I don't want to overdo things
"De eerste keer dat ik omloop was ging ik me overal aanbieden. Toen heb ik me de hele dag het schompes gelopen. Later ben ik gewoon gaan zitten en gewacht wat er komen gaat."

I know how to be not of influence
"Hoe langer je ergens zit, hoe meer je zeg maar thuis bent in een organisatie. Je hoort veel, je weet veel, maar als ZZP'er kun je daar eigenlijk nooit een mening over ventileren."

I know where I can intervene
"Iemand die op een drukke dag zijn consult komt doen is lastig af te houden, maar tegen bezoek kun je wel ietsje makkelijker zeggen van: 'goh geef nou even rust; neem zelf ook even rust.'"

I know how to communicate
"Wij moeten best veel onderhandelen. Je moet de dingen een beetje handig zien te brengen en weten wat ieders stokpaardje al of niet is."

I want to be efficient
"We hebben toch tekorten? Dan gaan we een beetje tijd zitten te verspillen om bij elkaar te komen om het over... ja waar hebben we het dan over? Nergens over. Je moet gewoon gelijk beginnen."

I know your skills progress
"Een tijdje terug zag ik iemand die nog nooit een spuit had klaargemaakt. Dan zie je een gehannes, echt niet te geloven. Onhandig gedoe. Maar ja dat heb ik ook gehad natuurlijk!"

I feel of importance
"Ik ben het verlengde van de arts. Je moet echt wel meedenken, nadenken, en de arts attenderen van 'goh heb je daar en daar al aangedacht?'"

I want to work together efficiently
"Ik vind het fijn om van te voren af te spreken welke patiënt we als eerste gaan wassen. Je kunt beter samen beginnen; anders liggen patiënten half bloot te wachten op hulp van een collega."

I can pass on my values (and v.v.)
"Het is makkelijker om kritiek te geven aan studenten. Ze staan er opener voor, want ze willen leren. Maar andersom sta ik ook open voor hun nieuwe blik."

I accept everyone in our team
"Een ex-patiënt gaat met de wens-ambulance naar een voetbalwedstrijd. Een detacheerder heeft veel voor hem gezorgd, en hij mag mee. Dan denken wij niet van 'jij bent gedetacheerd dus jij mag niet mee.'"

I want to have mutual respect
"In de loop der jaren heb je veel ervaring met verschillende culturen gekregen. Je moet proberen daarin mee te gaan, maar wel tot je eigen grenzen."

I feel accepted by the physicians
"Ik voel me altijd serieus genomen, in die tien jaar tijd heb ik 100% dat vertrouwen gekregen. Dingen gebeuren in overleg en mijn mening wordt niet zo hups aan de kant geschoven."

I aim for a strong, efficient team
"Je moet dingen steeds opnieuw uitleggen aan detacheerders en studenten. Daarvoor hadden we een vast team, dat draaide als een trein. Als je op elkaar ingespeeld bent kun je rustiger en sneller werken."

I aim for a team with one mindset
"De betrokkenheid van detacheerdes naar zowel de patiënt en het team toe is over het algemeen iets minder. Sommige collega's nemen het laconieke gedrag over. Basiszorg gaat daardoor wat achteruit."

I try to understand one's habits
"We hebben een collega en die is zelf Marrokaans, dus die legt ons soms ook wel dingen uit hoe dat dan werkt met het bezoeken van zieke familieleden."

I want to have mutual respect
"Je moet er als verpleegkundige voor zorgen dat je je niet laten overrulen door de artsen. Soms heb je artsen die denken: ik ben de arts, ik weet het het beste."

I feel that I'm trusted
"In hectische situaties is communicatie heel belangrijk: wie doet wat, wat ga jij doen, hoe ga je het doen, etc. Als je elkaar langer kent, dan hoeft het vaak niet meer van 'hoe ga je het doen?'"

I want to do it right
"In het begin van je carrière vind je al het nieuwe eng, alleen maar omdat het nieuw is en je er te weinig over weet. Maar in de loop der jaren groei je daarin."

I want my skills to progress
"In principe wil iedereen wel eens streep zijn. Maar stel dat iemand het moet doen die hier al jaren werkt en er is een jonge collega die het wil doen, dan wordt dat wel overgedragen."

I aim for conformity
"Mijn positie als ZZP'er is toch anders. Ik probeer mensen niet zo snel aan te spreken op hun gedrag."

I try to understand one's feelings
"Ik probeer mezelf vaak in de rol van de familie te plaatsen. Ik zou misschien ook wel uit mijn slof schieten als ik het er niet mee eens ben. Ik moet alleen wel oppassen dat ik niet over me heen laat lopen."

I don't want to overrule others
"Ik ben nu nog leerling, dus ik zit natuurlijk nog in een bescheiden rol. Het is niet dat je zegt van dit moet je zo doen en dat zo. Ik wil niet de betweter uithangen."

I do it the way they do it
"Als je op een gegeven moment ergens langer werkt dan weet je ook wel een beetje wat wel en niet kan en mag. Als ik echt twijfel, dan vraag ik het even aan collega's: wat is hier gebruikelijk?"

I feel too much in control
"Doordat je zo lang ergens hebt gewerkt en opeens van baan verandert, word je daar toch wat onzekerder van. Soms ga je dat compenseren door je grenzen misschien wat strakker in te stellen. "

I need multiple signals
"Als er dus zo'n alarm is, dan zie je al die stoelen naar achteren schuiven en je ziet iedereen kijken in de richting van waar het vandaan komt. Als er dan mensen beginnen te rennen, dan sta je op en ga je kijken."

figure 18 – A smaller version of the canvas about the sociocultural dimension 'hierarchy'. The dots indicate what each part is about.

1 VALUE ORIENTATION (KNOWLEDGE LEVEL)
The value orientation describes the ICU (sound) culture on a general, national level. Dutch ICUs similar to the ones observed should more or less fit the described value orientation, because the findings are on a high abstraction level: they are "valid beyond the sampled data" (Sanders & Stappers, 2012).

2 PRACTICES (INFORMATION LEVEL & KNOWLEDGE LEVEL)
Compared to the value orientation, the practices describe the ICU (sound) culture on a deeper, sometimes more specific level, involving different abstraction levels: it shows both generalizable insights (applicable to all the observed ICUs (and beyond)), but also insights that are unique to a particular ICU (Sanders & Stappers, 2012).

3 NEEDS OF THE THREE PERSONAS (KNOWLEDGE LEVEL)
The needs of the three personas are on a high abstraction level: they are applicable to a large number of ICU nurses, divided in three archetypal representations of ICU nurses working at a Dutch ICU similar to the ones observed (see next section 3.2.2). The archetypal representations can be seen as different cultural groups.

4 INDIVIDUAL EXPERIENCES AND NEEDS (DATA LEVEL & INFORMATION LEVEL)
The individual experiences and needs describe the ICU (sound) culture from the perspective of one particular nurse. The quotes (and the values and needs derived from it) are personal, though other nurses, possibly belonging to that particular persona, might identify themselves with these quotes.

3.2.2 THREE PERSONAS

Generally speaking, the nine participants, coming from different ICUs, could be divided into three segments based on shared customs, beliefs and needs. The segments are derived from statements about differences in the team that nurses expressed during the interview, but also from the general analysis-on-the-wall. Because when making sense of the nurses' practices in terms of their underlying values, it became clear that nurses might differ in value orientations and practices related to the core values they share. A matrix with two driving forces and three segments emerged as a result. All nine participants could be allocated to one or more of these segments.

The segmentation process

The ICU nurses are differentiated by two 'general' driving forces: a nurse's orientation of wellbeing and a nurse's perceived control (see figure 19). A nurse's orientation of wellbeing explains whether a nurse acts more from the perspective of his or her personal wellbeing (e.g. "I do this, because it is beneficial for me") or more from the perspective of other's wellbeing (e.g. "I do this, because it is beneficial for the patient or my colleague"). A nurse's perceived control explains to what extent the nurse experiences having control over his or her environment. This controlled environment consists of colleagues, patients, family members, and also the medical devices (e.g. "I decide" versus "others decide"). The driving forces could be replaced by other forces (one's orientation of wellbeing could be substituted with one's sensitivity to sounds for example), whilst still keeping the similar three segments.

Moving from one segment to the other

The allocation of a participant to a specific segment is not an absolute truth – his or her allocation might differ in certain situations. For example, a nurse with a high perceived control might also have a good understanding of when to abandon him or herself and follow someone else's opinion. A nurse could also move towards another segmentation for a longer period of time: a nurse with a high perceived control might become more of a follower who wants to act in line with the new colleagues when changing jobs. Another example of changing segments might be a consequence of one's evolvement over time: a nurse might become more oriented upon his or her 'personal wellbeing' because of his or her attachment to own habits and beliefs. The changes in a nurse's orientation due to both short-term and long-lasting events are good examples of the dynamic nature of people's behaviour and how it is shaped by their surrounding cultural context.

Structure of each persona

The three types of ICU nurses were all translated into a fictional persona. Personas are a good means to enhance "engagement and reality" with people in the context (Grudin & Pruitt, 2002) because they show a narrative constructed out of data that is collected through user research with 'real' people (for this project: observations and interviews). Therefore, this type of communication means was regarded as valuable for this project. The final personas for this project were communicated through a foldable flyer, again "using quotes (data), interpretations of the quotes (information) as well as the general rules that are operating in the given situation (knowledge)" (Sanders & Stappers, 2012) (see figure 20). Each persona shows general characteristics of a fictious nurse and his or her value orientations and attitude towards sounds (see figures 21, 22, and 23).

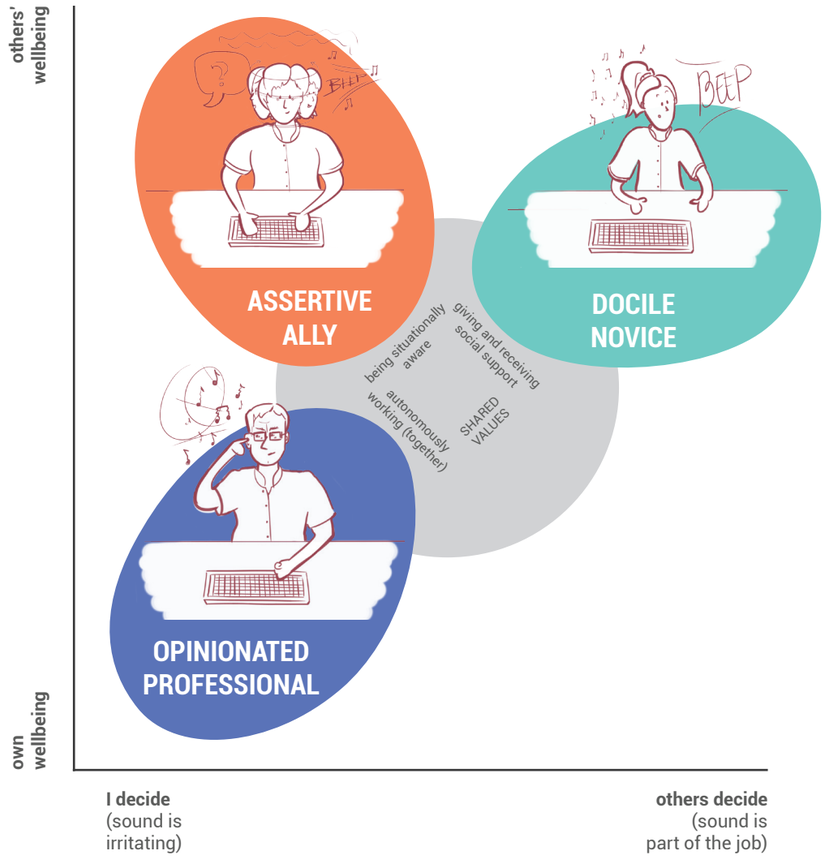


figure 19 – Visualisation of the segmentation among the nursing team. They share three (sound-related) core values: autonomously working (together), being situationally aware and giving and receiving social support.

figure 20 – The foldable flyers created to present the three personas. The personas were made in Dutch in order to keep the nuances in the interview quotes. Additionally, it was expected that the personas would be used by native Dutch speakers.

EIGENZINNIGE VAKMAN

ZELFSTANDIG
EFFICIËNT
DIRECT
REALISTISCH
KLEIN HARTJE

MIJN ROL

DIT BEN IK IN HET TEAM
Natuurlijk zijn we allemaal afhankelijk van elkaar, maar ik vind het ook fijn om mijn eigen gang te gaan. Mijn collega's vertrouwen mij. Als ik iets opvallends signaleer weet ik bij wie ik moet zijn en hoe ik de boodschap moet overbrengen. Ik ben oprecht en kan goed zeggen waar het op staat.

"De laatste 10 jaar merk ik echt dat als ik zeg dat er gezeik is en dat er iemand nu moet komen, dat er nooit discussie is. Er komt gelijk iemand."

"Het is nogal uitzonderlijk dat je familie hebt zonder dat er gezeur is, dat ze zich niet bemoeien met dingen wat niet moet, wat niet handig is."

DIT BETEKEN IK VOOR DE PATIENT
Ik ben de vertegenwoordiger van de patiënt. Ik wil professioneel overkomen, zodat de patiënt en familieleden zich durven over te geven. Soms vragen ze veel van je, wat veel energie kost. Ik geef bij collega's aan dat ik dan niet dag in, dat uit voor die patiënt wil zorgen.

MIJN STERKE KANTEN

DOOR DE JAREN HEEN
...heb ik een heel scala aan grapjes ontwikkeld waarmee ik de patiënten en familieleden even kan laten lachen.

...ben ik een stuk handiger geworden in mijn handelingen. Ik heb echt een vak geleerd. Daardoor weten anderen ook weer wat ze aan je hebben. Ik heb een naam gekregen.

...bemoei ik me niet meer met alles en iedereen om me heen. Dat levert ook alleen maar prikkels op. Ik laat anderen nu ook meer hun ding doen die zij willen doen.

"Soms blijven er wel 10 familieleden voor de box staan. Dan zeg ik vaak wel: 'joh ga even naar de familiekamer'. Want we zijn Artis niet. Het is hier geen aapjes kijken, en het geeft ook veel onrust."

DIT VIND IK SOMS LASTIG
Ik probeer de rust te bewaken voor mijn patiënt, voor zover dat kan met al die disciplines en familieleden op de werkvloer. Er zijn zoveel consulenten met allemaal een eigen planning die óók hun werk moeten doen. Soms moet je echt optreden als een waakhond.

DINGEN DIE MIJ BEZIGHOUDEN

> De transformatie naar taakgericht werken (speciale 'poepruimers'). Ik ben toch eigenlijk veel te duur?

> De complexiteit van het vak. Er zijn zo veel facetten waarmee je rekening moet houden.

> De verspilling van geld aan onnodige behandelingen.

> De complexere en groeiende patiënten populatie. Hoe moet ik dit werk tot aan mijn 67e volhouden?

EEN AANGRIJPEND GELUIDSMOMENT

"Als je stopt met de behandeling van een patiënt, waarschuw ik de familie dat ze niet moeten schrikken. Zodra je de beademingsmachine stopzet, daalt er echt een indrukwekkende stilte neer. Die kan aangrijpend zijn: het is ineens wel heel erg stil, zo definitief."

figure 21 – Contents of the flyer for persona 1. Each side addresses a certain topic.

VALUES & CHARACTERISTICS | COMMUNITY & DIVISION OF ROLES | INFLUENCE OF AGE AND EXPERIENCE | MACRO DEVELOPMENTS

BELIEFS ABOUT SOUNDS IN THE ICU | COPING STRATEGY | MOTIVES TO GO ALONG WITH CHANGE | DIRECTIONS FOR DESIGN INTERVENTIONS

DIT VIND IK VAN GELUID

DEZE INVLOED HEEFT GELUID OP MIJ
Ik ben vrij gevoelig voor geluid, meer dan anderen. Vooral voor overbodige herrie, van alle mensen op de afdeling, mijn collega's. Lang niet iedereen is er bewust van. Maar ik heb er gewoon echt last van, laat staan de patiënt. Ik kan mensen niet goed verstaan en ik kan me niet goed concentreren. En zeg zelf, als je continu uit je slaap gerukt wordt, ben je toch ook niet te genieten overdag?

"Jonge mensen kunnen veel makkelijker het geluid over zich heen laten gaan; laat maar gaan... Die groeien daar misschien ook mee op, die gaan natuurlijk ook naar al die festivals, hardcore, en weet ik het allemaal."

DIT ZIJN ALARMEN VOOR MIJ
Alarmen zijn voor mij niet altijd nodig. Ik kan alleen al aan de machinegeluiden horen of alles al dan niet goed gaat. Als er veel alarmen in de kamer zijn moet er eerst even wat uit, want anders kan ik niet doorwerken. In het geval van een reanimatie krijg ik echter zoveel adrenaline, dan verdwijnen er vanzelf geluiden op de achtergrond.

DAT MULTI-GELUID, WAAR IS DAT VOOR NODIG? ÉÉN KLEIN BIEPJE, EN IK WEET GENOEG HOOR.

ZO GA IK OM MET GELUID

"Ik zeg wel eens: kan je even op het knopje drukken?! Dan denk ik: gooi dat ding uit!"

GRIP OP DE GELUIDSOMGEVING
Ik voel me niet altijd gesteund in het reduceren van geluid, zowel door de apparaten en het gebouw als door mijn collega's. Er zijn dus behoorlijk wat dingen die geluid maker waar ik weinig aan kan doen. Dat frustreert mij. Soms zeg ik tegen mijn herriemakende collega's dat ik er last van heb Maar soms moet ik maar gewoon vluchten naar mijn eigen nisje of ander hokje. Maar in je nisje impliceerje eigenlijk oo dat je gestoord mag worden...

"Ik ben een enorm pleitbezorger van de privacymodus op de patiëntmonitor. Dan kan de patiënt doorslapen. Helaas krijg ik het er bijna niet in. Laatst maakte een jonge collega er wél gebruik van. Ik vertelde haar hoe blij ik hierom was."

HOE JE MIJ MOTIVEERT

ZO BEREIK JE MIJ
Ik wil dat anderen mijn irritaties serieus nemen. Misschien moet ik het hogerop zoeken om mijn punt duidelijk te maken. Dat we echt scherp gaan kijken van wat kan minder en minder hard, en dat we gelijk actie gaan ondernemen. We moeten elkaar erop gaan wijzen, want anders wordt er nooit iemand bewust van.

TONE OF VOICE
> Doeltreffend
> To the point/direct
> Realistisch
> Meelevend

"Als flexwerker heb je geen tijd om alle protocollen door te lezen, dat zijn er zo veel! Dus vraag ik het snel aan collega's."

NU HAAK IK AF
Laten we niet denken, maar doen. Dan gaan we bij elkaar zitten om het ergens over te hebben, maar waar hebben we het dan eigenlijk over? Als het me te veel moeite kost en ik zie het nut er niet van in, dan geef ik het gauw op. Misschien wil ik me wél inschikken als het beduidend beter is voor de patiënt.

IDEEËN DIE MIJ AANSPREKEN

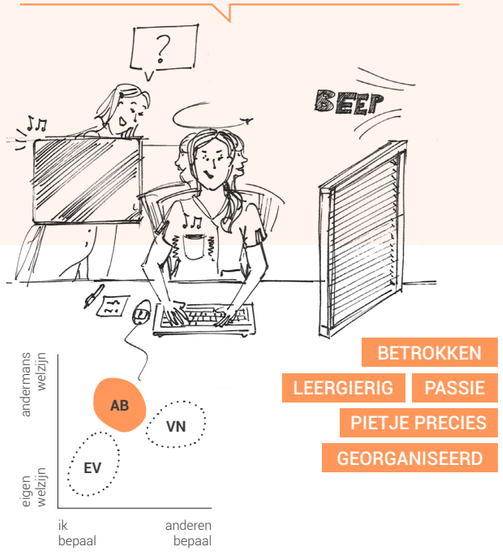
VOORWAARDEN
> Focus op individueel handelen
> Gemakkelijk integreerbaar in mij dagelijkse routine
> Taak erbij? Neem ook een taak weg!
> Aanpasbaar aan mijn eigen voorkeuren

AUTOMATISCHE PRIVACYMODUS
Een patiëntenmonitor die automatisch in de privacymodus gaat als ik een tijdje niet op de box sta, en die met een simpele druk op de knop weer geactiveerd kan worden (wat betekent dat er weer geluiden en grafieken te zien zijn).

Zo'n automatische privacymodus scheelt mij weer een handeling bij het verlaten van de box en het geeft rust voor de patiënt en familie. En dat scheelt mij weer werk om hen gerust te stellen.

ASSERTIEVE BONDGENOOT

"Ik heb 100% dat vertrouwen gekregen. Dingen gebeuren in overleg en mijn mening wordt niet hups aan de kant geschoven."



BETROKKEN
LEERGIERIG
PASSIE
PIETJE PRECIES
GEORGANISEERD

MIJN ROL

DIT BEN IK IN HET TEAM
Ik ben een echte teamplayer, maar ben ook zelfstandig. Ik heb 100% dat vertrouwen gekregen. Ik wil iedereen, met dezelfde instelling, verder helpen. Ik sta open voor kritiek en durf dat ook te geven, vooral als het echt nodig is. Dat doe ik liever wel één op één dan in de grote groep.

"Bij oudere verpleegkundigen is soms minder ruimte om feedback te geven. Ze doen het al jaren op een bepaalde manier. Maar soms moet je feedback geven. Vaak komen ze er gewoon mee weg... Daar zijn ze handig in geworden."

"Met foto's zie je hoe de patiënt eigenlijk was en met dat whiteboard kan bezoek laten weten wat de patiënt wel of niet fijn vindt, waar die graag naar kijkt. Je hebt gelijk ook een instap bij de patiënt over wie er langs zijn geweest."

DIT BETEKEN IK VOOR DE PATIENT
Ik ben erg betrokken. Iedere patiënt is uniek en moet je persoonlijke aandacht geven. Ik laat de patiënt en familie hun emoties uiten, maar ik breng ook positiviteit. Hoop geven is belangrijk, geen valse hoop. Ik schep duidelijkheid. Als ik zie dat het niet binnenkomt, herhaal ik dingen en laat ik bijv. zien wat het effect is van al het bezoek.

MIJN STERKE KANTEN

DOOR DE JAREN HEEN
...ben ik door mijn eigen levenservaring gegroeid in de omgang met familie. De IC heeft natuurlijk een enorme impact. Je eigen emotie tonen kan, dat geeft ze soms ook meer steun, maar ik wil wel professioneel blijven.

...weten artsen en collega's echt wat ze je aan je hebben.

...blijf ik open voor ontwikkeling. Ik leer van mijn collega's en vooral van de enthousiaste studenten.

"Bepaalde interne artsen hebben totaal geen sociale vaardigheden. Die komen 's nachts luidpratend bij een patiënt naar binnen. Je probeert ze weg te sturen, maar sommigen vinden zich nu eenmaal belangrijker..."

DIT VIND IK SOMS LASTIG
Ik bescherm de patiënt en kom op voor zijn rust tegen collega's en het bezoek. Patiënten kunnen en durven dat niet altijd. Ik denk zeker aan de behoeftes van het bezoek - ook van andere culturen - maar mijn eigen grenzen, en vooral die van de patiënt, zijn ook belangrijk. Ik grijp in als de patiënt het gezellige gekletst op de gang zou kunnen horen. De zorg mag daar niet de dupe van zijn.

DINGEN DIE MIJ BEZIGHOUDEN

> Het verbeteren van de zorg. Ik neem deel in werkgroepen en ga veel naar bijscholingen, ook in mijn vrije tijd.

> Je verdiepen in iedere patiënt en 'op maat gemaakte' topzorg leveren.

> De groter wordende teams en toename van detacheerders. Zij kunnen een andere instelling hebben.

> Druk op de bedden. Hierdoor gaat de kwaliteit van zorg achteruit.

EEN AANGRIJPEND GELUIDSMOMENT

"Tijdens de overlap van diensten is er qua praten echt een top herriemoment. Zeker als je in dat overlappende uur van de dag naar de avond niks meer te doen hebt, wat soms voorkomt. Maar ook van de avond naar de nacht, dan heb je zo al 16 mensen op de afdeling, plus nog wat cursisten."

figure 22 – Contents of the flyer for persona 2. Each side addresses a certain topic.

VALUES & CHARACTERISTICS | COMMUNITY & DIVISION OF ROLES | INFLUENCE OF AGE AND EXPERIENCE | MACRO DEVELOPMENTS

BELIEFS ABOUT SOUNDS IN THE ICU | COPING STRATEGY | MOTIVES TO GO ALONG WITH CHANGE | DIRECTIONS FOR DESIGN INTERVENTIONS

DIT VIND IK VAN GELUID

DEZE INVLOED HEEFT GELUID OP MIJ
Ik verbaas me soms over de gevoelige informatie die we met elkaar delen op de gang. Als de doktoren visite lopen, en de deuren zijn open, kunnen de patiënten wellicht over elkaar horen hoe het gaat. Ook zorgt hun aanblik voor onrust bij de patiënt. En zo zijn er nog veel meer dingen die hen angstig kunnen maken. En daar hebben wij echt een rol in; een gemoedelijke afdelingssfeer zou al kunnen helpen.

"Als iemand net gediplomeerd is en die stelt zijn alarmen strak in dan accepteer ik dat. Maar sommige collega's gaan zelf aan de alarmen schroeven. En ze communiceren dat dan niet echt op een leuke manier."

DIT ZIJN ALARMEN VOOR MIJ
Ik heb nogal de neiging om als ik iets hoor daarop te reageren. Dat kan je afleiden van de alarmen van je eigen patiënt. Alarmen reduceren is goed, maar we moeten goed kijken naar de rol en impact van ieder alarm: wat vertellen ze ons? Het gaat om het totaalplaatje: wat is nodig voor de patiënt en wat zijn de behoeften van de verpleegkundige.

KIJK NAAR DE ROL EN IMPACT VAN IEDER ALARM: WAAROM MOET HET JE ALARMEREN?

ZO GA IK OM MET GELUID

"Bij het invoeren van het nachtprotocol moesten we met veel belangen rekening houden. Sommigen zeiden: het eerder wisselen van spuiten is niet goed voor het milieu."

ELKAARS BELANGEN BEGRIJPEN

GRIP OP DE GELUIDSOMGEVING
'Niks is altijd' door de acute situaties. Ook al kun je een bepaald streven hebben, je moet vaak schipperen tussen verschillende belangen van zowel de patiënt als alle andere disciplines. Het is belangrijk dat het team als een trein loopt Zo kun je vlot en makkelijk communiceren. Alle nieuwelinge en detacheerders maken dat soms lastig.

"Vanmorgen heb ik bij een collega getwijfeld om te vragen: wil je wat zachter praten? Dus ben ik zelf zachter en rustiger gaan praten. Soms nemen mensen dat over."

HOE JE MIJ MOTIVEERT

ZO BEREIK JE MIJ
We moeten samen gaan kijken naar oplossingen voor geluidsreductie. Dat begint met de neuzen in dezelfde richting krijgen en elkaar goed te begrijpen. Een plan kan daarbij goed helpen. Ik wil wel een rolmodel zijn. Door zelf het goede voorbeeld te geven hoop ik anderen te inspireren en motiveren minder geluid te maken.

TONE OF VOICE
> Doelgericht: waar werk je naartoe?
> Inhoudelijk/Onderbouwd
> Optimistisch/Motiverend
> Visionair

"'s Nachts zeg ik wel tegen collega's dat ze te luidruchtig zijn, maar overdag vind ik dat lastig. 's Nachts kun je ze namelijk op het nachtprotocol wijzen."

NU HAAK IK AF
Als we geen gezamenlijk doel en niet dezelfde instelling hebben wordt het lastig. Het frustreert me als anderen de kantjes ervan aflopen. We hebben toch afgesproken het op een bepaalde manier te gaan doen?

IDEEËN DIE MIJ AANSPREKEN

VOORWAARDEN
> Focus op sociaal handelen (met de behoeften van de patiënt als uitgangspunt)
> Een verandering die het probleem bij de bron aanpakt
> Begrijpbaar voor iedereen, ook als een en ander gepersonaliseerd kan worden

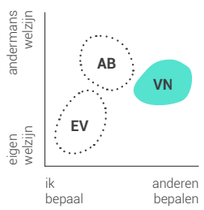
INZICHTELIJK MAKEN VAN GELUIDSPRODUCTIE
Een interactief schilderij dat op een laagdrempelige en ietwat grappige manier laat zien hoe luid het op de IC was de afgelopen uren, zou een eerste stap in de goede richting zijn. Hopelijk worden al mijn collega's langzaamaan bewust van het geluidsprobleem.

Een extra infographic die ons vertelt wat de geluidsbronnen waren en hoe we ons verhouden tot het gemiddelde geluidsniveau en ons uiteindelijke doel, zou ons kunnen helpen om ons geluidsproducerende gedrag te herkennen en te veranderen. We zouden elkaar kunnen wijzen op de status van het interactieve schilderij.

VOLGZAME NIEUWELING

"Als er een alarm gaat omdat een collega is vergeten iets uit te drukken, dan ga ik erheen om te helpen. Ik ga niet snauwen."

VEILIG
BEHULPZAAM
LEERGIERIG
GEZELLIG
SAMEN



MIJN ROL

DIT BEN IK IN HET TEAM
Het team voelt als een warm bad. Je kunt bij elkaar terecht voor vragen of bedenkingen. Iedereen helpt je verder; zo leren we weer van elkaar. Samen verdiepen we ons om tot de juiste zorg te komen. Ik voel me gerespecteerd, en ik respecteer mijn collega's, met ieder hun eigen blik en specialisme.

"Toen ik hier vorig jaar kwam stond iedereen open om je dingen uit te leggen. Iedereen durft ook wel naar mekaar toe te komen als je niet meer weet hoe het zat, ook door het onderling specialisme."

"Persoonlijke verzorging doe veel in overleg met de patiënt. Het is wel iemands lijf. Ze raken al veel zelfcontrole en zelfzorg kwijt. Ik wil niet datgene afnemen waar ze zelf nog iets over te zeggen hebben."

DIT BETEKEN IK VOOR DE PATIENT
In probeer een schone omgeving te creëren, voor de patiënt maar ook voor mijn collega's. Ik wil het de patiënt zo comfortabel mogelijk maken. Dat zou ik ook fijn vinden. Ik toon begrip voor de familie en neem de tijd om dingen uit te leggen. Dat werkt vaak beter dan dat je overal bovenop zit.

MIJN STERKE KANTEN

DOOR DE JAREN HEEN
...leer ik steeds meer mijn eigen grenzen en die van de patiënt kennen. In het begin had ik nog wel eens de neiging om alles uit handen van de patiënt te nemen.

...leer je wanneer je humor kunt gebruiken, door te kijken hoe een patiënt is.

...kan ik steeds sneller linkjes leggen: als dit alarm gaat, dan moet ik dit en dat doen.

"Ik probeer mezelf vaak een beetje in de rol van de familie te plaatsen. Hoe zou je zelf reageren? Jij en ik zouden misschien ook uit je slof schieten als je het ergens niet mee eens bent. Maar ik moet wel oppassen dat ik niet over me heen laat lopen."

DIT VIND IK SOMS LASTIG
Ik moet soms oppassen dat ik niet over me heen laat lopen, door zowel familie als de artsen. Ik ben een beetje bescheiden, en ik wil ook niet de betweter uithangen die het wel even komt vertellen hoe het moet. Daarnaast moet je echt goed kijken naar de patiënt waneer hij rust wilt. Helaas zijn patiënten niet zo assertief.

DINGEN DIE MIJ BEZIGHOUDEN

> Het klinisch redeneren. De theorie in de praktijk brengen, verbanden leggen, en steeds beter weten welke acties je moet nemen.

> De complexe patiëntencategorie: de uitdagende casussen revalideren. Maar de boog hoeft natuurlijk niet altijd gespannen te zijn.

> Hopelijk blijft het werk menselijk en persoonlijk, ondanks alle digitalisering (wat ik overigens wel weer prettig vind).

> Collega's die vertrekken vanwege de grote veranderingen, zoals de nieuwbouw, en dingen als de beddendruk. Zijn vaak collega's die snel overprikkeld waren.

EEN AANGRIJPEND GELUIDSMOMENT

"Het kan soms best wel veel tegelijk zijn. Dan moet je denken: wat is het geluid, waar hoort het bij en welke is dan dus...? Gelukkig kun je dat meteen op de monitor zien, zo van: ow het is de bloeddruk, ow het is de beademing, etc."

figure 23 – Contents of the flyer for persona 3. Each side addresses a certain topic.

VALUES & CHARACTERISTICS | COMMUNITY & DIVISION OF ROLES | INFLUENCE OF AGE AND EXPERIENCE | MACRO DEVELOPMENTS

BELIEFS ABOUT SOUNDS IN THE ICU | COPING STRATEGY | MOTIVES TO GO ALONG WITH CHANGE | DIRECTIONS FOR DESIGN INTERVENTIONS

DIT VIND IK VAN GELUID

DEZE INVLOED HEEFT GELUID OP MIJ
Ik weet dat sommige collega's zich irriteren aan de alarmen en alle andere geluiden. Maar ik ervaar het niet als lawaaierig. Er lopen gewoon veel mensen rond, er is leven. Ik kan me er redelijk goed voor afsluiten ook. Sommige collega's geven me een snauw naar aanleiding van mijn alarmgrenzen. Dan maak ik een grapje, maar ondertussen denk ik wel: oke, ik moet even aan mijn grenzen werken! Ik ben er veel mee bezig.

"Het is niet dat ik expres ga fluisteren op de box omdat de patiënt het zou kunnen horen. In het dagelijks leven wordt er ook gewoon gesproken, dus ik zou niet weten waarom het hier niet zou kunnen."

DIT ZIJN ALARMEN VOOR MIJ
Ik heb alarmen nodig om mijn patiënt in de gaten te houden. Ik weet het, misschien ben ik wel een beetje een control freak. Maar de stabiliteit van de patiënt maakt dat we alarmen krijgen. Als ik de alarmen probeer te beperken doe ik dat voor de patiënt, niet zozeer voor mezelf.

IK HEB ALARMEN NODIG. EEN ALARM BETEKENT DAT ER IETS AAN DE HAND IS.

ZO GA IK OM MET GELUID

"Het zou fijn zijn als iedereen een rood alarm op zijn pieper krijgt. Dan is iedereen een beetje gealarmeerd en alerter, zoals het vroeger was."

STREVEN NAAR GEZAMENLIJKE CONTROLE EN VEILIGHEID

GRIP OP DE GELUIDSOMGEVING
De hoeveelheid mensen op de werkvloer kun je weinig aan doen; dat ligt ook een beetje aan de opzet. Maar als ik de box blindeer, heeft de patiënt weinig last van die onrust den ik. Als je zelf ook op zo'n afgesloten box staat, voel ik me overigens niet veilig. Als er iets gebeurt, hoort niemand je.

"Ik wil op mijn pieper kunnen terugkijken welke alarmen zijn gegaan, zoals we op de oude hadden. Als er steeds een piepje gaat en ik ben de hele tijd te laat om te kijken, dan kan ik later bekijken of het een terugkerende trend is. En dan kan ik mijn grenzen ietsjes lager zetten of ietsjes aanpassen."

HOE JE MIJ MOTIVEERT

ZO BEREIK JE MIJ
Ik sta zeker open voor verandering. Als je mij vertelt wat ik kan veranderen ten behoeve van de patiënt of mijn collega's, ga ik daar mijn best voor doen! Ik heb daar misschien wel wat steun bij nodig. Ook wil ik goed en veilig mijn werk kunnen blijven doen.

TONE OF VOICE
> Onderbouwd
> Vertrouwen scheppen
> Begripvol
> Kritisch

"Ik heb voor het ICCU team gekozen omdat mensen zo open zijn, mekaar durven aan te spreken, en ook kunnen zeggen wat ze kwestbaar maakt als verpleegkundige."

NU HAAK IK AF

"Wat als er uit jouw onderzoek komt dat veel geluiden vervelend zijn? Dan denk ik: die geluiden hebben ook allemaal betekenis. We moeten niet willen dat de apparaten allemaal zachte tonen gaan maken omdat het voor ons vervelend is. Het maakt ons ook weer alert."

IDEEËN DIE MIJ AANSPREKEN

VOORWAARDEN
> Intuïtief gebruik, zodat ik dingen gemakkelijk kan leren
> Integreerbaar: het moet communiceren met alle andere apparaten
> Veilig in gebruik

CONTINU MONITOREN

Het vertalen van de patiënt zijn parameters in 'muziek', en het horen van die muziek door middel van een oortje dat je in hebt, geeft mij de mogelijkheid om continu mijn patiënt te monitoren. Zodoende zou ik de trend in de gaten kunnen houden. Als ik hoor dat de muziek een beetje vals gaat klinken, zou ik onvoorziene omstandigheden kunnen voorkomen.

Een kanttekening hierbij is dat het monitoren dan vooral op mij aan komt. Terwijl ik het erg fijn vind als andere collega's mijn patiënt óók een beetje in de gaten houden. We zouden dus goed moeten kijken hoe we elkaar nog steeds kunnen ondersteunen.

3.2.3 HOW THE PERSONAS EXPERIENCE AND COPE WITH THE SOUNDS

The fictional personas differ in gender: they are presented as a male or female person. Therefore, following explanations use (possessive) pronouns that fit the gender of the persona. In fact, both female and male nurses could belong to persona 1, 2 and/or 3.

Persona 1 – Opinionated professional
Persona 1 is an opinionated nurse, who developed his own habits and beliefs throughout the years. He is autonomous and confident in taken (medical) actions. These characteristics are acquired thanks to the many years of work experience (see figure 21).

Persona 1 is really sensitive to the sounds in the ICU – the sounds irritate him: they arrive quickly in his 'allergy'. This is caused by factors that violate a couple of needs: his need for efficiency (e.g. some sounds disrupt his workflow), his need for ease (e.g. some sounds are, in his opinion, superfluous) and, most importantly, his need for environmental control. In certain sound-producing events, persona 1 fights against or flights from the sounds (see figure 24). This way, persona 1 tries to make the situation less noisy. However, the actions often have a short-term effect only: the next day, a sound-producing event can get on his nerves again.

Persona 2 – Assertive ally
Persona 2 is a passionate nurse: providing the best critical and personal care is close to her heart. She is a team player and has confidence in her (medical) actions. She likes to exchange knowledge, and due to her work experience, she inspires the younger part of the team.

Persona 2 is sensitive to sounds because they affect the patient's and the team's wellbeing. The patient might be torn out of his sleep and hear sensitive issues about himself or other patients due to the team's conversations in the corridor. Additionally, team members might be confused by all the puzzling alarms that go off, leading to missed alarms, and a busy and tense department atmosphere. So, compared to persona 1, persona 2's irritation is more induced by the harm done to other's wellbeing than the harm to her personal wellbeing (see figure 22).

Persona 2 acts on sound disturbances in a more nuanced way than persona 1. Persona 2 tries to understand the sound disturbance in its context, thinking of: why is it there, who and what causes it, and what can I do myself to change the situation? When a colleague produces sounds that have to be there or nothing can be done about it, persona 2 can accept the situation; she empathises with the colleague's needs. When a colleague is involved in a sound-producing events that seems irrelevant, persona 2 might act: she nudges the colleague towards the 'right' sound-reducing behaviour or she actively supports the colleague in changing his behaviour (see figure 24). So, the sound-reducing attempts of persona 2 seem more thought through and they might be more impactful in the longer term than those of persona 1.

Persona 3 – Docile novice
Persona 3 is either a student/qualified nurse at the beginning of his or her career (< 3 years of experience), a new team member, or a flex worker with little physical commitment to the team. Persona 3 seeks for group affiliation and tries to find a balance between the beliefs and needs of her colleagues and those of her own (see figure 23).

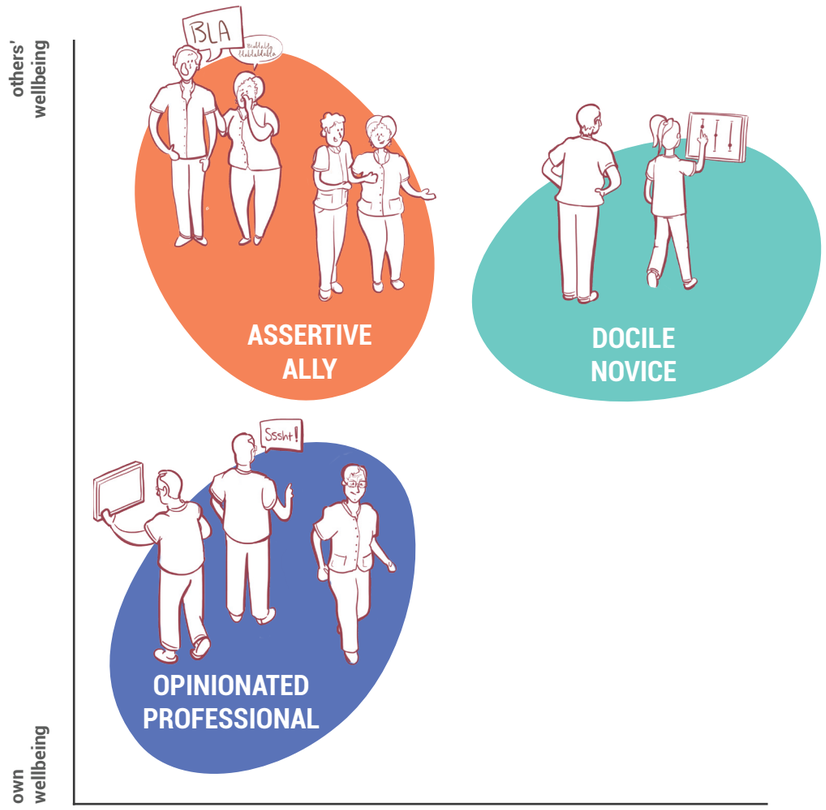


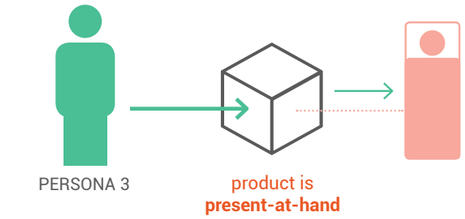
figure 24 – Visualisation of the segmentation among the nursing team and how they cope with the sounds induced by their colleagues (through the products).

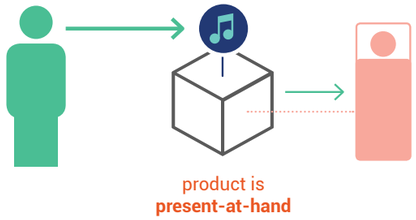
Adding to that, flex workers might specifically avoid group affiliation, because they avoid sticking to the permanent staff

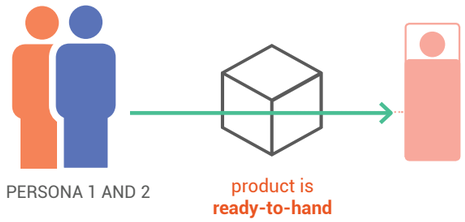
Persona 3 is less sensitive to sounds because she is dependant on the devices' alarms. This is induced by her lack of confidence. First of all, she might lack confidence because she is not fully aware of the interconnectedness between all the beeping machinery and the patient's status. Therefore, she needs more time for connecting the alarm to the potential problem. She might also lack confidence because she is, simply put, new into an environment and wants to do it right. Narrow alarm boundaries assure her that she will not miss any critical event.

In addition to the low sensitivity and the importance of alarms, persona 3 might be less aware of the 'sound problem' because she does not know the sounds' negative consequences on the patient's status. Additionally, she might think sounds are inherent in the ICU because she has no 'quiet' frame of reference.

Due to the low sensitivity to sounds and lack of awareness of the sound problem, persona 3 shows little efforts to act silently. When older, more experienced colleagues force or ask her to do so, for example by working on her alarm limits (see figure 24), she tries to accommodate to their needs. However, due to her dependence on alarms, she might experience difficulties with acting in line with the preferences of her colleagues and establishing a safe situation.







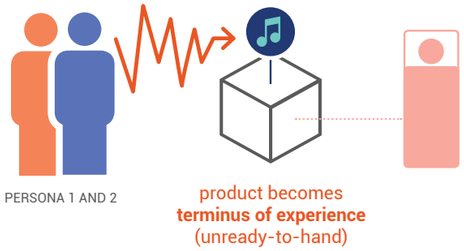


figure 25 – The differences in how the machine enables the personas to control the patient's status and how the product, or sound, becomes the "terminus of the experience" (Verbeek, 2006) when an alarm goes off for persona 1 and 2.

3.2.4 HOW THE PERSONAS MANAGE THE ALARMS

Setting alarm boundaries

Nurses can set the boundaries of the patient monitor to control the frequency of alarms going off to a certain extent. The three personas show different preferences when it comes to these settings, ranging from wide boundaries (fewer alarms) to narrow boundaries (more alarms). This is backed up by Bogers (2018), who already discovered that narrow boundaries might cause irritation among some of the nurses. Bogers (2018) developed an 'alarm management preference model', in which he shows five behavioural traits that define a nurse's alarm management. With the knowledge of the different types of ICU nurses, this model was elaborated with the preferences of each persona (see figure 26).

Behavioural patterns when an alarm is ringing

Generally speaking, nurses show two behavioural patterns when a low priority alarm sounds from a monitor(ing) device: (1) pause the alarm on the patient monitor and, if deemed important, find and take away the cause, or (2) find and take away the cause, if deemed important, in order to take away the alarm (and otherwise, pause the alarm). The first pattern is often followed by persona 1 and 2; the older, more experienced nurses who immediately want to get rid of the sound. The second pattern is often followed by the younger, less experienced nurses. working on the cause, they can hear and/or see whether it takes away the sound or not. When nurses just pause an alarm and do not act any further, they need to know the risk of doing so. A nurse's work experience seems to influence how he or she assesses the risk.

The behavioural pattern of persona 1 and 2, who immediately pause the alarm and then decide what to do, might be explained by the fact that the alarming device moves from being 'ready-to-hand' towards 'present-at-hand' (Verbeek, 2006) (see figure 25). Ready-to-hand means that the device is an extension of the nurse: over time and experience, the nurse got attuned with the device and got to know its interconnectedness within the context. This 'ready-to-hand' state of the device enables the nurse to derive the attention from the machinery to the patient. When a device is present-at-hand, it means that the nurse interacts with the device consciously, it is the "terminus of their experience" (Verbeek, 2006). So when a device starts beeping, the alarm might become the "terminus of the experience" also: the device could rather be seen as present-at-hand, or even 'unready-to-hand'. By pausing the alarm, the device moves from being a hindrance for doing the job to being a facilitator, with which persona 1 and 2 can stabilize the situation again (Dotov, Nie, & Chemero, 2010).

For persona 3, the monitoring devices are present-at-hand by default. Compared to the older and more experienced nurses, younger and less experienced need to get attuned with the device. Their attention is primarily focused on the device. The nurses are in the learning process of setting the device correctly and understanding the device's connectedness with the world. Persona 3 needs the device's alarms to understand the patient's status.

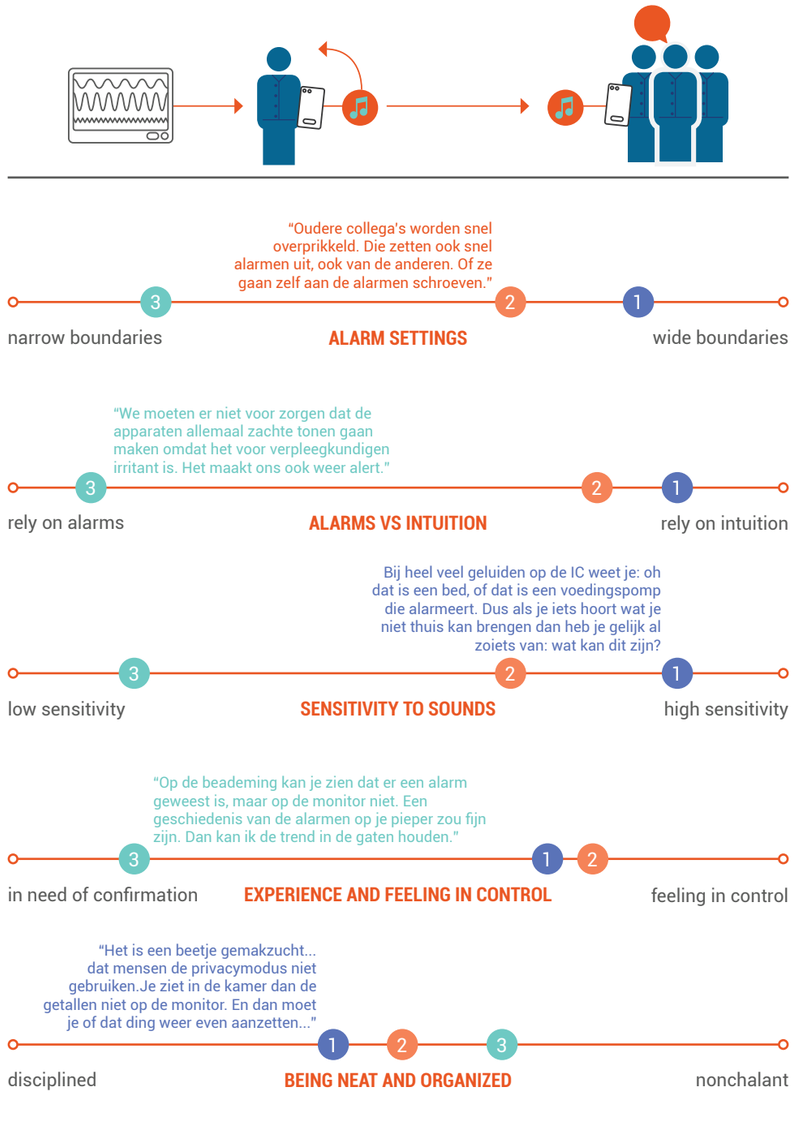


figure 26 – Alarm management preferences for each persona (indicated with the dots), based on the model created by Bogers (2018). Quotes from the interviewees are added as well.

3.2.5 CORE VALUES, NEEDS AND PRACTICES

As said, when making sense of the nurses' practices in terms of their underlying values, it became clear that nurses share certain values but their value orientations and practices might differ. The following subsections describe these shared core values and needs, and which core value is in favour of each persona (see figure 27).

The need for social support

Verbal communication as a manifestation of the need for social support

In all ICUs, it is highly visible that nurses, and other clinicians and non-clinical staff members, use verbal communication in order to fulfil the four common functions of social support. The first function that it fulfils is the ability to give 'informational support' to each other as well as to patients and family members. Many nurses state that verbal communication is key for discussing and taking medical actions: it is fast, ad hoc, more nuanced and they can make their point stronger if needed. The second function that verbal communication fulfils is the realization of 'tangible support': nurses could, for example, shout out to each other to grab a certain tool or give each other instructions while washing a patient together. The third function that verbal communication fulfils is the ability to give 'emotional support' to each other as well as to patients and family members. Talking about hectic situations and expressing intensive negative emotions make it bearable to work, or simply be present, in the ICU. Humour is deemed extra important in these situations. The fourth function that verbal communication fulfils is the realization of 'companionship support': having social activities together, such as having a coffee with your colleagues, enhances the sense of belonging to a group (see figure 16 FIXME). Many nurses emphasise this by saying that 'work should be fun as well'. All in all, verbal communication seems to enhance the team spirit and to make working or simply being present in the ICU emotionally endurable, or enjoyable.

Generally speaking, younger, less experienced nurses (i.e. persona 3) rely on having social support more than the older, more experienced nurses for several reasons. Firstly, younger nurses might need more help with decision-making as well as they need to justify their medical actions to others more often. Secondly, they need to get familiar with the medical machinery and therefore rely on tangible support from their colleagues. Thirdly, they need to get used to the violent events at work: the urge of expressing their experiences and involving emotions might be higher than colleagues who have been doing this work for years. Fourthly, newcomers are in the process of finding their role in the team. Moreover, the idea of being part of the team gives younger, less experienced nurses a safe feeling – it assures them there is always someone who can help. So, having social support creates a safe working environment which the younger, less experienced nurses need to get familiar with.

The need for situational awareness (all together)

As can be read in section FIXME, nurses can consult various sources and signals to be aware of their patients' status. Many nurses emphasise they want to be fully aware of the signals in their environment in order to create safe circumstances for the patient and themselves – they want to be 'situationally aware'.

Many nurses mention the importance of having situational awareness all together. They want to be aware of what is happening in the other patient rooms, so they know when somebody needs assistance (during critical events). The other way around is also true: they want other colleagues to be aware of what is happening in their own room as well. Because knowing there is always a colleague who can help gives them a secure feeling. So, being situationally aware enhances the joint responsibility for the patients' and each other's wellbeing.

Pager notification system

A pager notification system might enhance a nurse's situational awareness and the feeling of connectedness to other colleagues. However, all the alarms coming from other colleagues are experienced as too much. Nurses have the urge to pause them continuously (leading to critical alarms that might be missed), or they even leave the pager unattended at a nursing desk. The latter might be perceived as a sign of irresponsibility to other colleagues; a nurse cannot rely on another nurse who deliberately left the pager. So, a pager notification system might actually harm situational awareness and the feeling of connectedness to other colleagues.

Nurses working in an ICU without a pager system rely merely on the device's alarms in the patient rooms, forcing them to leave the door of the rooms open. So, the absence of a pager makes the ICU a more 'open' workspace in which alarms coming from different patient rooms sound through each other (leading to a high cognitive load among the nurses). Ironically, nurses working in an ICU with a pager system might sometimes leave the doors open as well. They mainly do so because they cannot rely on the pager since some alarms do not come through and the doors block too much sound (both when being inside and outside the patient room). The failure of the pager system and the doors being too much of a physical barrier harm the connectedness between patient and nurse and between nurses themselves. So, even with a pager system, nurses might transform the ICU in an 'open' workspace, in which the alarms of the monitoring devices and pagers sound through each other.

Generally speaking, persona 2 is highly in favour of being situational aware all together so that everyone can help each other out. Due to her experience, she is skilled in coping with all the signals, and to pay attention to other colleagues and their patients as well (more than the younger, less experienced nurses for example). However, as said, the excessive amount of alarms and colleagues not actively paying attention to their pager harm her situational awareness. Therefore, persona 2 experiences difficulties with creating a 'balanced' sound environment, that ensures a proper level of situational awareness.

The need for working autonomously (together)

Working in the ICU is teamwork, but many nurses also want to practice their own rituals and routines, and to be committed to the patient individually. According to Bogers (2018), these rituals and routines might be difficult to change because they help nurses to cope with the dynamic nature of the ICU: the "constant factor" helps them "in being ready to respond to unexpected events". Changing them might also be avoided by the fact that nurses respect each other's behaviour and needs, especially those of the older, more experienced nurses. So, the great value attached to having own habits and individual commitment, and respecting each other in doing so, might create a culture in which common goals and group efforts disappear to the background.

Discouragement of sound-reducing practices due to low perceived (individual) control

The lack of common goals and group efforts might have an effect on the taken efforts to reduce sounds (i.e. alarms, speech, incidental and background sounds). Some nurses indeed show individual practices for doing so, but such intentions are not always supported due to the fact that nurses differ in their intentions and efforts for sound-reduction. Other discouraging barriers are the dynamic nature of the ICU, sounds that are inherent in the medical devices, a nurse's need for narrow alarm boundaries, and an ICU's architecture. Those barriers are often deemed as 'part of the ICU context'. They might give nurses, with sound-reducing intentions, a helpless feeling and, in the end, discourage them to actually practice these intentions. Because "why should I act silently when my colleagues and all these other things are causing sounds as well?"

Especially persona 3 shows feelings of discouragement when trying to reduce sounds. He attaches great value to autonomy and competence – and these needs are highly affected by the colleagues who differ in intentions and efforts and all the other barriers in the context (see section FIXME). Therefore, persona 3 his willingness and perceived control are affected. A critical note to this is that although persona 3 wants to see group effort for sound-reduction, he also wants to have enough individual freedom to practice it his own way because his own habits are still important.

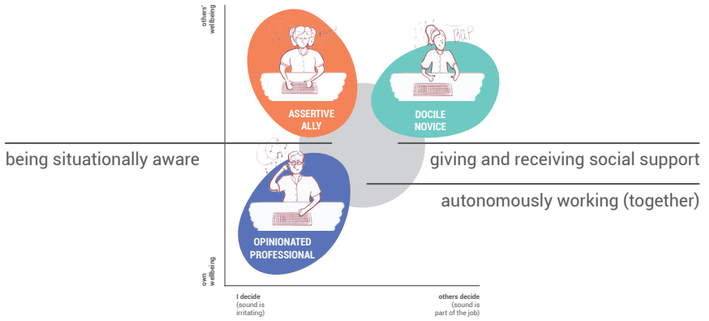


figure 27 – Visualisation of the segmentation among the nursing team. They share three (sound-related) core values: autonomously working (together), being situationally aware and giving and receiving social support. But their value orientations may differ.

3.3 · DISCUSSION

The aim of the field research was to capture and typify different ICU sound cultures, involving ICU nurses' (sound-related) core values and how uniform they are in practising these values. I had the opportunity to compare six different Dutch ICUs and nine nurses working in one or two of these ICUs. Because the ICUs differed in patient population (e.g. the amount of patients, complexity and disease type), team size and architecture, I could pinpoint similarities and differences in the nurses' core value orientations, and what makes it that some values are practised differently or even not shared.

In this section, I reflect upon the initial research questions:

1. What are the shared values and practices in different ICU sound culture(s)?
2. How can design contribute to sound reduction in the ICU whilst considering the ICU sound cultures?

3.3.1 CORE VALUES OF THE DUTCH ICU SOUND CULTURE

Nurses working in the same Dutch ICU and nurses working in different ICUs share three (sound-related) core values: autonomously working (together), being situationally aware and giving and receiving social support. It seems that the accompanying practices are transmitted through learning and typical for the Dutch ICU (sound) culture. Although some beliefs and behaviours might just be the nature of the beast, medical and technical actions, and social interactions seem to be shaped by experience on the work floor. Nurses learn by doing and knowledge is often transferred from one to another. This already starts at the beginning of a nurse's education, where the older, more experienced nurses transfer their own practices and beliefs to the 'malleable' students. This way, a certain ICU (sound) culture – with shared, core values – is maintained, with changes over time due to innovations in healthcare for example.

Having said that ICU nurses, also when working in different ICUs, show similar (sound-related) values and practices, the following question arises: how uniform are nurses in their core value orientations and how they put these in practice?

3.3.2 DIFFERENCES IN VALUE ORIENTATIONS AND PRACTICES

Generally speaking, the core values are shared by all ICU nurses to a greater or lesser extent. This means that one nurse could attach more value to having social interaction than to being autonomous than the other nurse. The differences in core value orientations and accompanying practices occur when looking at nurses from different ICUs but also at nurses of one and the same team. The next subsections describe where the similarities and differences come from, looking at the ICU specific sound cultures and ICU specific group cultures within one and the same team (see figure 28).

◊ Similarities and differences between nurses from different ICUs due to specific ICU sound cultures

There is not one particular ICU sound culture: each ICU has its own. When looking at nurses from different teams, similar sound-related values might be practised in different ways due to a nursing team's spirit and contextual factors such as the ICU's physical environment and rules and regulations. For example, nurses working in different ICUs, but with the same intention of limiting alarms, might have different ways to deal with colleagues who are less concerned with limiting alarms. The social 'unwritten' rules in each ICU might differ or the physical environment in the one ICU supports sound-reducing intentions more than in the other ICU (see figure 19 FIXME: the top left, purple heart). Therefore, each ICU has a specific ICU sound culture.

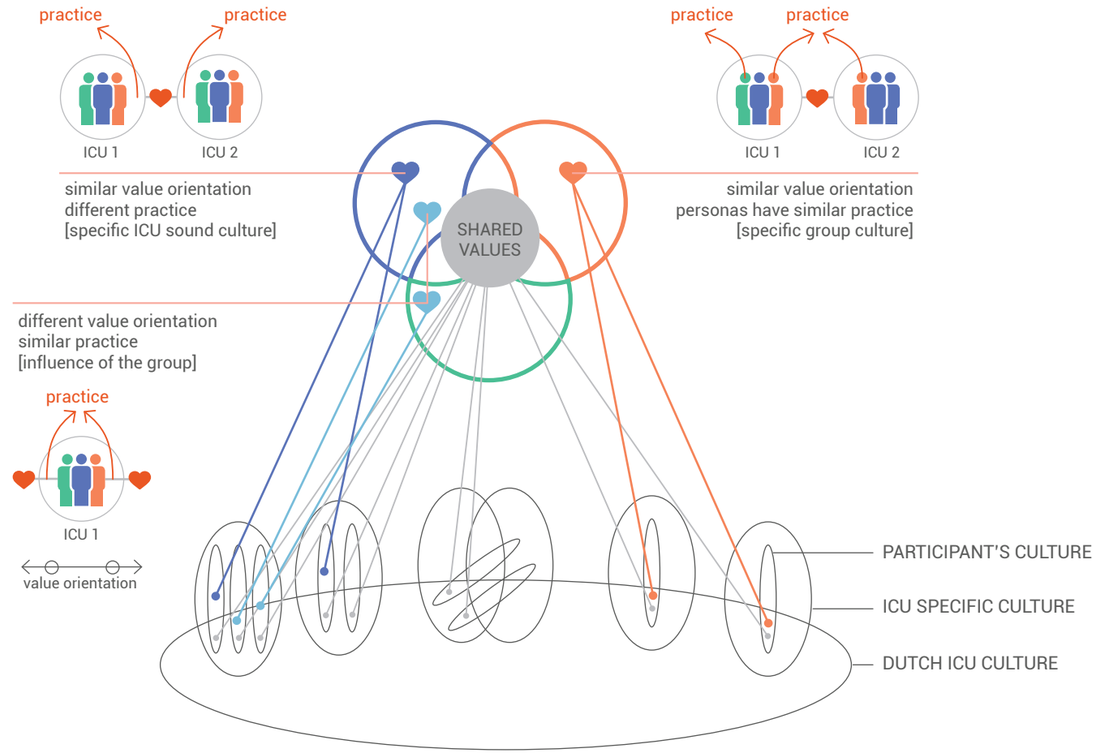


figure 28 – The cultural boundaries of the research. It shows where the core values are based upon: 9 participants from 6 different Dutch ICUs (from left to right – ICU specific culture: Erasmus MC (ICU), Eramus MC (ICCU), participant 4 and 5, HagaZiekenhuis, and participant 6). It shows the relation between value orientations and practices and how the Dutch ICU culture, ICU specific culture and the participant's culture (one's individual background) influence these relation.

◊ Similarities and differences between nurses from one and the same team due to specific ICU sound culture

When looking at nurses from one and the same team, nurses can differ in their core value orientations but still show similar practices. A nurse might have a rather different value orientation and view on practising this, but the influence of the group might 'force' him or her to follow the practices of colleagues (see figure 19 FIXME: the two little blue hearts). A good example of the influence of the team at one of the observed ICUs, is the change towards a more open and learning culture due to rather stubborn colleagues who stopped working or who retired. In this case, a particular group of nurses was dominant in shaping the ICU (sound) culture. Though some nurses found it important to provide each other with feedback, they followed the team's practice of respecting each other's habits and beliefs.

◊ Similarities and differences between nurses from one and the same team due to specific group cultures within the team

Though nurses of the same team might force each other towards similar practices, it is also possible that groups of nurses of the same team differ in their practices while having the same value orientation. This is where the 'specific group culture' comes into play, or in other words: with which stereotypical representation (i.e. persona) a nurse can be described (see figure 19 FIXME: the top right, orange heart). Setting the alarm boundaries in different ways (i.e. narrow or broad, see section FIXME) is a good example of how groups of nurses differ in the way of patient monitoring. Individual preferences and other values that are of influence are noticeable in this case, though all nurses strive for a safe way of patient monitoring. All in all, nurses might have different ways of fulfilling a certain shared value.

3.3.3 THE ICU SOUND CULTURE AND ITS RELATION TO THE SOUND PROBLEM

Though there are different sound cultures (see above), there is a commonality regarding the 'sound problem': in all ICUs, the sounds, or even issues with them, are sort of accepted to a greater or lesser extent. Several reasons could be given for this acceptance.

◊ Not everyone is aware of the sounds' negative effects upon people's wellbeing

Firstly, in every ICU, some ICU nurses are not aware of the sounds' negative effects upon the patient's and colleagues' wellbeing, or they are even not aware of the excessive amount of sounds. These ignorant nurses are mainly younger, less experienced nurses (without a 'quiet frame of reference') or nurses working in an ICU without a common mindset to reduce sounds. So these ignorant nurses do not have a clear and strong purpose for paying attention to their sound-inducing practices.

◊ Good intentions and efforts for sound-reduction are not supported

Secondly, good intentions and efforts for sound-reduction are not always supported, both by other team members with different intentions (which holds with the previous argument) as well as the dynamic nature of the ICU with all its inherent sounds. The impact of the sound-reducing intentions and efforts is especially low in the long-term because the efforts taken are solely changing sound-producing events ad-hoc. The low sense of support and impact leads again to a low willingness and/or perceived control for changing the sound-related practices.

◊ There are ways to escape from the sounds

Thirdly, nurses have opportunities to escape from the sounds for, mainly, their own wellbeing. Examples of such actions are mainly flight strategies, such as moving to a quiet nursing desk, putting on headphones or leaving your pager unattended at the nursing desk. It differs per ICU to what extent these opportunities are supported: 'written' and 'unwritten' rules and the material culture play a huge role in this.

◊ Sound-reducing practices may affect core values

Fourthly, sound-reducing practices may affect nurses' personal core values. As a result, dilemmas occur, which holds with finding a good balance between two needs perceived as opposing (see the core values and dilemmas in section FIXME). For example, the excessive amount of sounds may harm a nurse' situational awareness, but on the other hand, he or she also feels very familiar with using sounds as signals to know what is happening. So, a nurse may see a particular sound-reducing practice as an attack on his or her core values and practises.

To conclude, the arguments show that ICU nurses have different beliefs, intentions and efforts when it comes to changing sound-related practices. Sounds play a different role for every nursing team and individual nurse. Sounds or sound issues are 'accepted' due to nurses not knowing why (by being ignorant or indifferent) or not knowing how to reduce sounds.

3.3.4 OPPORTUNITIES FOR DESIGNERS TO ADDRESS THE SOUND ISSUES FROM A CULTURAL PERSPECTIVE

The cultural-conscious approach taken during the field research helped in developing an understanding of the ICU nurses' (sound-related) values and practices. Students and researchers of the Critical Alarms Lab could use this understanding when developing design interventions in order to change sound-related practices. I definitely see opportunities for them and other designers to shape the 'material culture' of the ICU in such a way that sound-inducing practices are limited/avoided or nurses are encouraged to act on sound-producing events. To do so, designers must carefully tune their designs with the ICU nurses' existing beliefs and shared core values. The designers can use the created personas to get an understanding of the ICU nurses and the cultural context they are designing for.

Creating sound-issue-awareness

In addition to designers' ability to make a difference in shaping the material culture in such a way that it nudges nurses towards sound-reducing practices, I see a big challenge in making the nurses aware of the 'sound problem' for which they are partly responsible. Redert's (2018) design, Doplor – an interactive painting on the wall that corresponds to the sound levels in the ICU accordingly (see introduction) – is a good first step in doing so, but several nurses will likely not see the point of it. They might be unaware of the sounds' negative consequences on the patient's wellbeing, or they might not know how to act upon it. Therefore, I see an opportunity to create a common mindset upfront, in which all ICU nurses know the consequences of their behaviour for the sound environment and other people's wellbeing, and also know how to act upon that if needed and possible. The next chapter describes the development and execution of this 'collective ICU sound culture', in which everyone feels responsible for or is aware of their sound-inducing practices and feels intrinsically motivated to act upon them.

04

HOW DESIGN CAN CONTRIBUTE TO SOUND CULTURAL CHANGE

The previous chapter gave insights in the current ICU sound cultures, describing ICU nurses' daily (sound-related) practices and the (shared) core values these manifestations come from. Based on these insights, I found an opportunity for designers to change the sound culture with sound-reducing design interventions, whilst affirming and tuning with the ICU nurses' core values. However, I see a bigger opportunity one step ahead of this – an opportunity that aims to bring the 'ICU sound issues' to the surface, creating a common mindset in which all ICU nurses are aware of the consequences of their behaviour on the sound environment and the patient's and each other's wellbeing. Preferably, in a later stage, the nurses know how to act upon that if deemed needed and possible. This chapter describes the further development of this opportunity and the resulting strategy for making nurses 'sound-issue-aware' and, in the end, making nurses behave 'sound-consciously'.

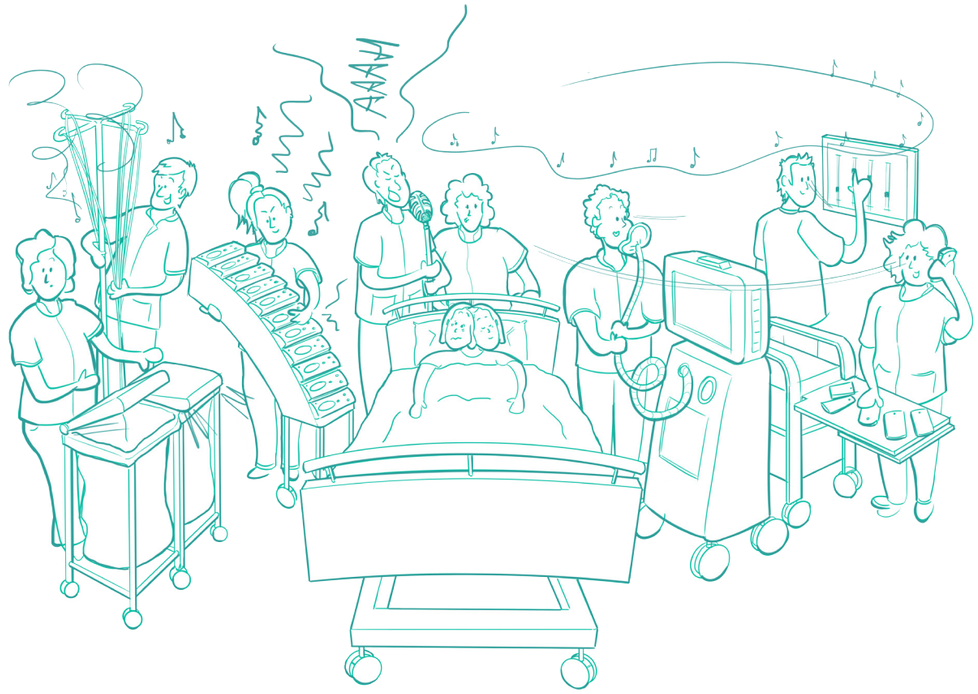


figure 29 – The visual metaphor for a collectivistic sound culture: nurses should feel like being part of an improvising big band. They are making harmonious music together, while having some individual freedom to go on a solo. Which instrument can each nurse play?

4.1 · WHAT SHOULD AN ICU KEEP AND CHANGE IN ITS CURRENT SOUND CULTURE?

4.1.1 WHAT IS TYPICAL ABOUT THE CURRENT ICU SOUND CULTURE?

As said in the previous section 3.3.3, ICU sounds, or even issues with them, are sort of accepted due to several reasons (which are summarized here). Firstly, in every ICU, it is highly noticeable that some ICU nurses are not aware of the negative effects of sounds on patients' and colleagues' wellbeing, or they are even not aware of the excessive amount of sounds. Secondly, good intentions and efforts for sound-reduction are not always supported, both by other team members with different intentions (which holds with the previous argument) as well as the dynamic nature of the ICU with all its sounds that are inherent in the environment. Thirdly, nurses have opportunities to escape from the sounds for, mainly, their own wellbeing. Fourthly, sound-reducing practices might affect the nurses' core values. As a result, dilemmas occur, which holds often with finding a good balance between two needs that are perceived as opposing. So, all in all, sound (issues) are 'accepted' due to nurses not knowing why (by being ignorant or indifferent) or not knowing how to reduce sounds.

Generally speaking, the current sound-reducing actions are often taken individually, ad-hoc and they have a short-term impact. It often depends on how individual nurses interpret the situation and whether they think acting (more) silently is needed and possible, either reasoning from their own personal wellbeing or that of others. This, added to the fact that nurses attach great value to having their own habits and individual commitment to the patient and respecting each other in doing so (see section 3.2.5), creates a culture in which common goals and group efforts disappear to the background. As a result, individual efforts are taken ad-hoc, leading to sound-reduction with little impact.

4.1.2 WHAT IS THE DESIRED ICU SOUND CULTURE?

When ICUs want to reduce the sounds with a bigger impact in the longer term, ICUs need to create 'sound-issue awareness' and motivate every individual nurse to act upon the sound issues. Because nurses of one and the same team differ in how they experience the sounds and react accordingly, I challenge the ICU management team and nurses themselves to establish a 'collectivistic sound culture'. In a collectivistic sound culture, every individual nurse should commit to the group effort and goal to create a more peaceful sound environment in the ICU. Although the term 'collectivistic' seems to imply that the interest and needs of the group are deemed more important than one's individual interest and needs, nurses should experience that when working together towards a more peaceful sound environment – whilst considering and supporting each other's personal needs – every individual nurse may benefit from it.

Keeping the core values

As said, a nurse might judge a particular sound-reducing practice (e.g. caused by a design intervention) as a potential threat to his or her personal core values and practices. So when moving towards a more collectivistic sound culture, it is important to do so whilst keeping the shared core values of autonomously working (together), being situationally aware and giving and receiving social support. By stating that the nurses' core values are most important, it is more likely that they will get along in the process of change. Additionally, each nurse should be put in his or her strength: particular characteristics of each nurse (or persona) are important for tackling the sound issues. So, nurses should look for ways to reduce the sounds whilst still being able to practice their core values and stay who they are as they are more or less.

A metaphor for a collectivistic sound culture

The desired ICU sound culture should feel like a collectivistic culture, in which every individual nurse commits to the goal of creating a peaceful sound environment for the patients and the team. To make this rather abstract goal more vivid and to enable the nurses to empathise with it, a visual metaphor is created: nurses in a collectivistic sound culture should feel they are part of an improvising big band.

In an improvising big band, each member follows a particular rhythm and pace and pays attention to the musical expression of others. While doing so, he or she responses accordingly. The musicians have some individual freedom in the melody, but keep the goal of creating a harmonic piece of music in mind. The nurses should do so as well: they should strive for creating a balanced, peaceful sound environment. They have some individual freedom, such as in setting their alarm boundaries, but they should help each other when the environment starts to sound off-key. An older, more experienced nurse could provide a clearer rhythm through his 'double bass', for example. Just like an improvising big band, a nurse should pay attention to his or her own and other's sound-inducing practices (as musical expressions) and react accordingly.

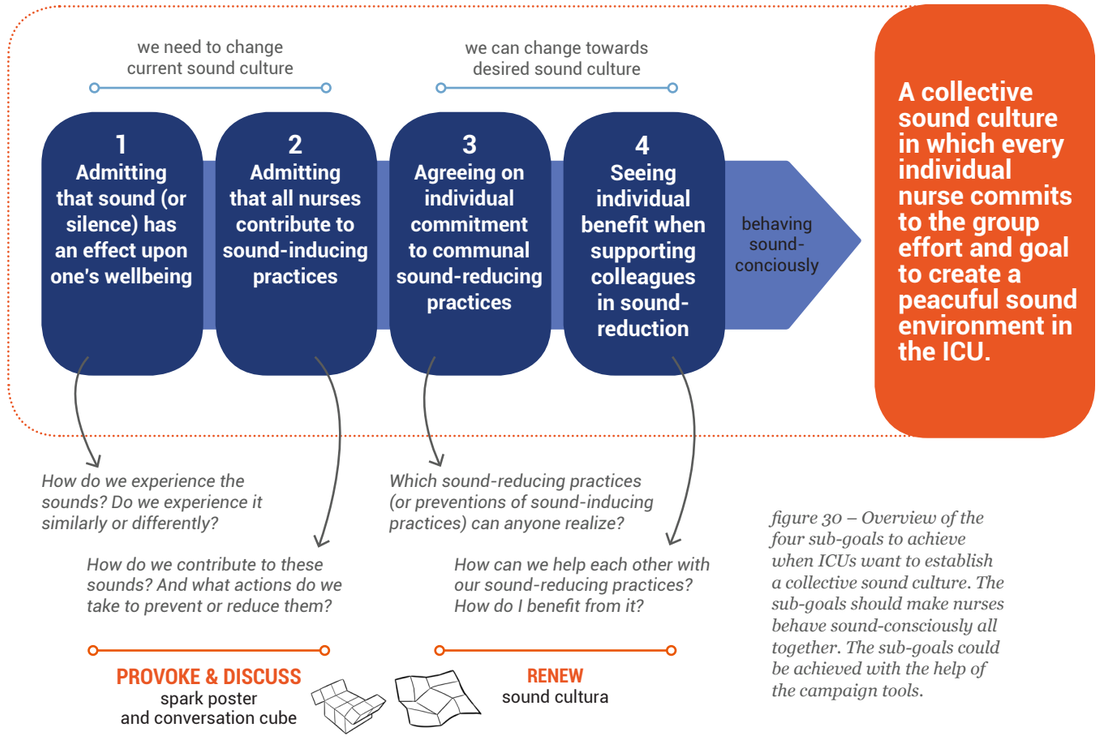


figure 30 – Overview of the four sub-goals to achieve when ICUs want to establish a collective sound culture. The sub-goals should make nurses behave sound-consciously all together. The sub-goals could be achieved with the help of the campaign tools.

4.2 · WHAT DO ICUS NEED FOR THE SOUND CULTURAL CHANGE?

To let nurses behave 'sound-consciously' – i.e. knowing the effect of your and others' behaviour on the sound environment and acting upon that – nurses have to admit that they need to change their current sound culture towards the collectivistic sound culture, and that they also have opportunities for doing so when everybody shows involvement. To create this common mindset of 'we need to change together' and 'we can change together', the team should establish the following beliefs (see figure 30; from here on called: sub-goals):

- ◊ Sound (or silence) has an effect upon one's wellbeing
- ◊ We all contribute to sound-inducing practices
- ◊ We should individually commit to communal sound-reducing practices
- ◊ We individually benefit when supporting each other in sound-reduction

The next section gives further explanation about each sub-goal.

4.2.1 CREATE, REVIEW AND/OR REVISE THE NURSES' BELIEFS

Seeing the need for change

◊ Sound (or silence) has an effect upon one's wellbeing

To let nurses behave sound-consciously, nurses first have to recognize the need for, or purpose of, doing so. Therefore, nurses have to become aware of the fact that sounds might be an issue and that they differ in how they experience the sounds: something can be harmful to one nurse and not to another. As a consequence, nurses have to admit that action is needed when a particular sound-inducing practice harms a patient's or nurse's wellbeing, with either reducing it or, preferably, preventing it. A critical note to this is that ICUs should not only focus upon the negative effects of sounds but also upon the positive effects of a more peaceful ICU. Good intentions for sound-reduction and little discussions about the excessive amount of sounds were seen and heard during the observations, so the opportunity for provoking a debate on the issue of sounds and the consequences of these sounds on a patient's and nurse's wellbeing is certainly present.

◊ We all contribute to sound-inducing practices

Besides admitting the need for change, ICU nurses need to admit that they play a role in the production of sounds. The main challenge is to let them realize that everyone contributes to the sound environment. For example, if someone starts to talk loudly, others need to talk loudly too in order to transcend the sound level. Or when everybody has the routine to pause or ignore an alarm on the pager, the alarms 'circulate' through the ICU. So, nurses have to admit that the sound levels increase not only due to individual sound-inducing practices but also due to sound-inducing practices they jointly maintain.

Seeing they can change

◊ We should individually commit to communal sound-reducing practices

Besides their common contribution to sound-inducing practices, ICU nurses need to acknowledge they all should contribute to sound-reducing practices. Because of the individually taken sound-reducing practices and the resulting discouragement, the main challenge is to let nurses believe they can only change the sound issues when everybody puts effort to it. It does not mean that sound-reducing practices should not be taken individually: it means that ICU nurses should feel supported by each other due to them having the same intentions and efforts. Thus, ICUs need to move beyond individually taken sound-reducing practices that are perceived as a drop in the ocean.

◊ We individually benefit when supporting each other in sound-reduction

Besides having the same intentions and efforts taken for sound-reduction, ICU nurses need to believe they can help each other to reduce sounds. For reaching this mindset, ICUs should focus upon the (long-term) individual benefits that one may receive when helping a colleague. Because, as can be read in the results, helping each other out is not only done from the perspective of somebody else's wellbeing: especially persona 1 is also focussed upon 'what's in it for him'. Persona 1 should, for example, see that by offering constructive feedback and helpful tips about setting alarm boundaries to a younger, less experienced nurse, he could benefit from fewer alarms going off due to 'broader' set alarm boundaries. So, by supporting each other to reduce sounds, not only the receiver but also the one who offers the support may benefit.

4.2.2 CONCLUSION: WHAT DESIGN CAN DO

In order to create 'sound-issue awareness' and motivate all nurses to act upon the sound issues, a campaign over a period of time was deemed fruitful. Therefore, I developed three practical campaign tools that ask for involvement of the ICU management team (e.g. the nursing team lead) and nurses, though other clinicians can be involved too (because, in the end, all clinicians are part of the sound culture). Through three phases – provoke, discuss and renew – they will start the discussion about the topic of sounds in the ICU and how they can reduce noise with their own behaviour and resources.

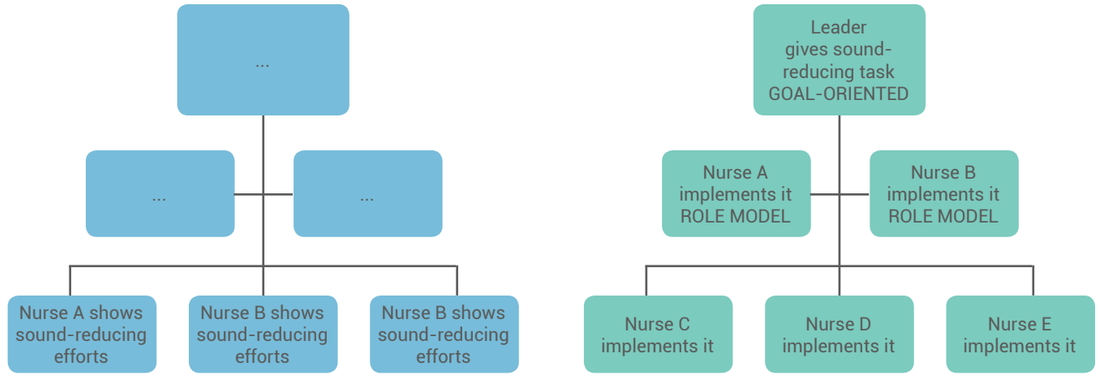


figure 31 – Bottom-up (blue) and top-down (green) sound reduction efforts. The existence of 'top-down' guidance and jointly set goals may encourage nurses to act in a more collectivistic way than at the bottom-up approach.

Why this type of campaign?

The campaign forms a middle ground between a top-down and bottom-up approach for sound cultural change. This is inspired by the sound-reduction approaches seen in the observed ICUs (see figure 31). The top-down approach is important for initiating the campaign and making the process of change goal-oriented. The ICU management team, or one of the nurses who is perceived as a role model, could initiate the campaign and convey they take the 'sound problem' serious and that involvement of all nurses is desired and needed (bottom-up). The initiators could guard the execution of the campaign. However, as said, when nurses are forced to implement a particular change without seeing the purpose of it, nurses often react too 'protective': they quickly identify potential threats for their personal values and practices. Therefore, incorporating a bottom-up approach that intrinsically motivates nurses to think of sound-related practices they need and can change themselves is important as well. So, someone from 'higher up' who encourages nurses – as the experts of their own experiences – will likely result in durable solutions with broad support.

ICUs should think of practices without actually changing the physical environment in terms of introducing 'new' products, such as Doplor (see section 1.1.1), at first. Nurses need to realize they can influence the physical environment as it is now, for example by more efficient usage of the pager or unpacking dialysis bags outside the patient room or corridor. Additionally, new products as new 'attention-seekers' might be too much of a cognitive load. Moreover, these products dedicated to sound-reduction might be ignored because nurses do not see the purpose of it and, therefore, incorporating such a product is perceived as too much of an effort. To make nurses 'more open' for such innovations at a later stage, nurses first have to recognize the 'need for change' and that 'they can change'.

Because nurses differ in how they experience the sounds and in their intentions to reduce sounds, it is important to consider how they all could be taken along in the process of sound cultural change. Based on the understanding of the personas (see section 3.2.3), it is expected that:

◊ Nurses who belong to persona 1, will likely be satisfied by the fact that someone from higher up admits their issues and help them to reduce sounds all together. They will also be flattered by the fact that they are regarded as the experts of their own experiences.

◊ Nurses who belong to persona 2, will likely be satisfied by the fact that the process of change will be started from the perspective of the ones who are mostly in charge of this change. They are open for innovation as long as it fits the patient's and team's needs.

◊ Nurses who belong to persona 3, will likely be on board when other colleagues do so as well. They are 'followers' who want to act in line with the group.

How the campaign and its tools could address the nurses and motivate them to move towards a collectivistic sound culture, is explained in the next chapter.

05

CAMPAIGNING FOR A COLLECTIVE SOUND CULTURE

The previous chapter described why the both top-down and bottom-up campaign approach was deemed fruitful for creating 'sound-issue awareness' and motivating all nurses to act upon the sound issues. To let nurses behave 'sound-consciously' – i.e. knowing the effect of your and others' behaviour on the sound environment and acting upon that – nurses have to admit that they need to change their current sound culture towards the collectivistic sound culture, and that they also have opportunities for doing so when everybody shows involvement. Through three practical campaign tools (the spark poster, conversation cube and sound cultura), the nurses will work on achieving and practicing this mindset of 'we need to change' and 'we can change' from bottom-up. This chapter describes how the campaign and its tools could address the ICU mangement team and nurses and motivate them to move towards a collectivistic sound culture.

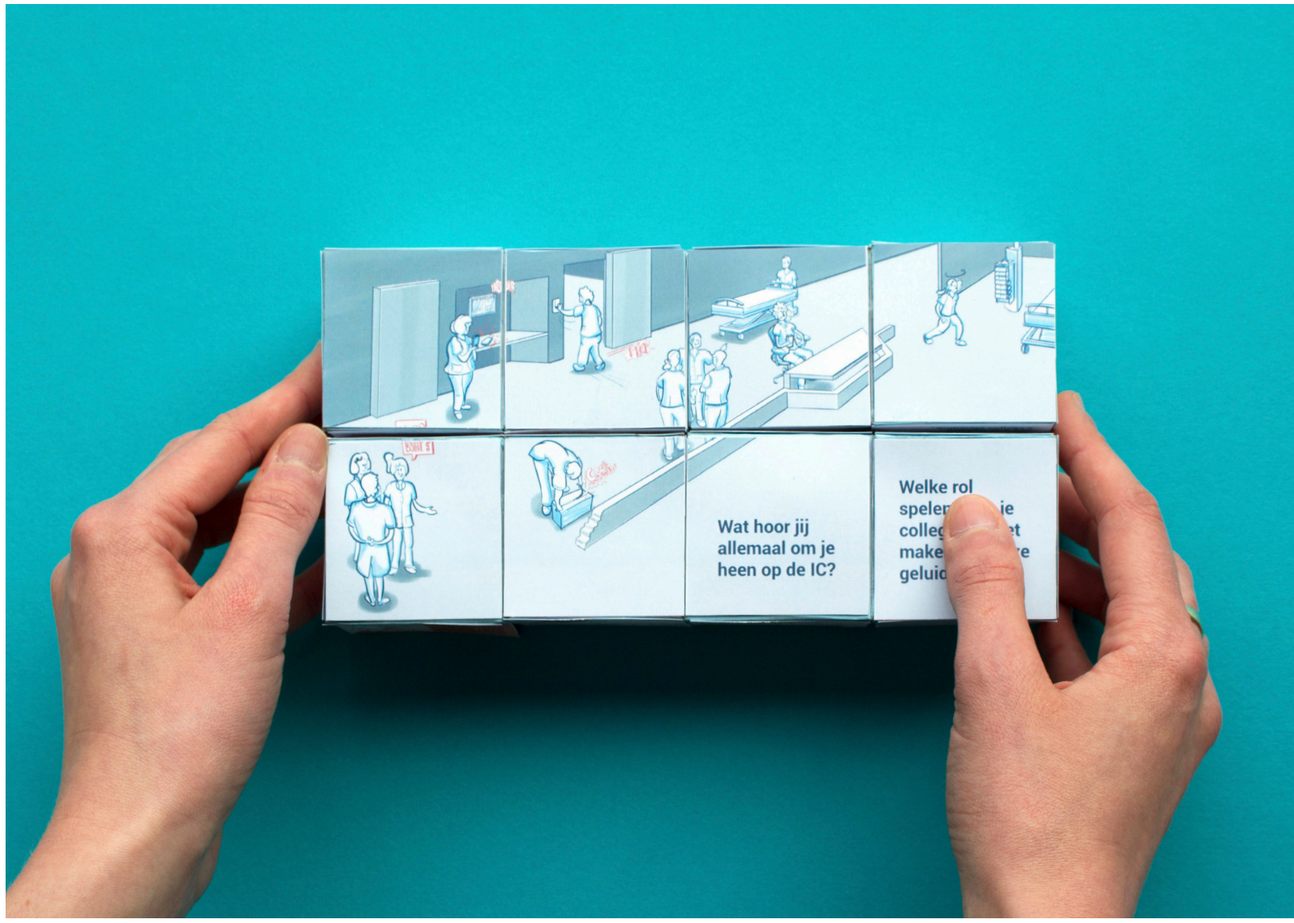


figure 32 – One of the images the user can create with the conversation cube.

5.1 · THE CAMPAIGN TOOLKIT

5.1.1 WHAT ARE THE CONTENTS OF THE CAMPAIGN TOOLKIT?

Through three phase – provoke, discuss and renew – the ICU management team and nurses will work on achieving four sub-goals (see figure 30 and section 4.2.1 in the previous chapter). The first two phase are connected to the first two sub-goals ("we need to change") and the third phase is connected to the last two sub-goals ("we can change"). The ICU management team and the nurses can use several practical tools that support them in achieving the sub-goals (see figure 33). The 'ideal' campaign toolkit consists of the following physical means:

- ◊ Spark poster: provoking nurses to have a first little discussion about the topic of 'sound in the ICU'
- ◊ Conversation cube: supporting nurses in an in-depth discussion about their sound-inducing behaviour and how they differ in sound coping mechanisms
- ◊ Sound cultura: supporting nurses in a brainstorm session about potential solutions and how they could help each other to reduce sounds through their own behaviour
- ◊ Roadmap poster: showing the ICU management team which sub-goals to achieve and how to get there
- ◊ Personas and a guide to get to know them: helping the ICU management team to get a thorough understanding of their employees
- ◊ Manual: giving the ICU management team background information about the field research of this project and the development of the campaign in order to show its validity

The toolkit is in Dutch for ICUs in the Netherlands, because people can best express themselves in their native language.

The first three tools were developed in detail. Due to time constraints, the other tools were not further detailed (except for the personas created during the field research, see section 3.2.2). In the remainder of this report, the contents of the three tools will be further explained.

5.1.2 WHO CAN USE THE TOOLKIT?

The campaign toolkit will be offered to ICU management teams of ICUs who are interested in understanding their current ICU sound culture and how they could move towards the desired ICU sound culture. The ICU management team takes the role of an initiator and facilitator, guarding the process of change. In the ideal situation, the team can order the self-explanatory campaign toolkit from a website, and use it on their own, without the help of a facilitator. The team should determine when it is the right moment to introduce the campaign and tools to the nurses, who are the main end users of the toolkit.

5.1.3 IMPORTANT ASPECTS TO CONSIDER FOR THE DESIGN OF THE CAMPAIGN TOOLS

Based on the current ICU (sound) culture, three aspects were deemed important for considering while developing the campaign as a whole and each tool specifically: the tone of voice, and the place and time (moment) of intervention. The next paragraphs describe these three aspects and their brief implications for the campaign as a whole and each tool specifically. In the sections afterwards, each tool is further explained.

Tone of voice

The campaign as a whole and each tool specifically all convey a particular message. To create the 'right' messages, I paid extra attention to the 'tone of voice' and 'mood'. The tone of voice is the writer's attitude or feeling towards the subject. This attitude or feeling is translated in a message consisting of words and/or visualisations, which again should cause a certain feeling upon the receiver. This is called the mood: it is the atmosphere or emotion that the receiver feels while or after reading/looking at the message. The challenge for the design of the campaign tools was that the receivers – the nurses (or personas) – differ in how they experience the sounds and issues. Therefore, extra attention was paid to how each persona should be addressed in order to encourage him or her to be involved in the process of sound cultural change.

PROVOKE	DISCUSS	RENEW
What? Provoking and encouraging the nurses to think about their contribution to the sound environment, through a funny yet serious tone of voice *Where?* In the lunch room, or online (WhatsApp, e-mail) *When?* When nurses are 'relaxing' during their work shift *Why?* To create a first little spark about the sound cultural change the initiator is aiming for	*What?* Informing the nurses about the different emotions and behavioural patterns caused by the sound-related practices, in a playful, exploring and questioning way *Where?* In a lunch or meeting room, or at the nursing desk later on *When?* During a clinical lesson (guided by nursing management or myself), or a 'relaxing' *Why?* To encourage nurses to have a group discussion about sounds in the ICU and to what extent their experiences are similarly or differently	*What?* Informing the management team and nurses about the transformation towards the desired ICU sound culture and how they could support each other in doing so, through a suprising and cheering (expandable) message *Where?* In a lunch or meeting room, or just when the occasion arises *When?* During a clinical lesson, or just when the occasion arises *Why?* To encourage the management team and especially the nurses to come up with concrete actions or a common goal to create a collective sound culture

figure 33 – Overview of the phases of the campaign and the three physical tools that belong to these phases.

In short, my message through the campaign as a whole is: work together towards a more peaceful sound environment, considering the patient's needs and those of every individual nurse. Each tool – the spark poster, conversation cube and sound cultura – supports this message. In the beginning, the spark poster and conversation cube should give an edgy/provocative message, especially towards those who should realize that the ICU is noisy because of their own behaviour and that sounds might be an issue. Throughout the campaign, the message should become more positive and encouraging. Through the sound cultura, nurses need to feel inspired and motivated in order to involve themselves in the process of sound cultural change, whilst having the feeling that their values and needs are respected.

Where the tool will be used

Because the ICU is a dynamic working and healing environment, accommodating people with rather different needs, it was important to critically think about the physical place of using each tool and who are involved unnoticed. For example, a spark poster with a visual that might be too confronting for family members, would better fit the pinboard in the employees canteen than in the ICU corridor. So, depending on the estimated chance of reaching others who should not be involved, and also on the moment of intervention (see next paragraph), the campaign tools are used in a 'public' or more 'private' space in the ICU.

When the tool will be used
Working in the ICU is also perceived as dynamic because situations on the work floor can immediately change. It asks the nurses to be flexible and adaptable to the circumstances. As a response to this, nurses like to have their own rituals and routines to a certain extent. Adding an extra task to do – for example, using a campaign tool – might quickly be judged as too much of a cognitive load. Therefore, it is important to consider when nurses think they have time to pay attention to each tool. Since the dynamic nature is especially true during a day work shift, nurses will likely be more interested in using a campaign tool at dedicated 'team moments' (e.g. during a clinical lesson), throughout the evening/night shifts, or weekend shifts.

5.2 · SPARK POSTER

The spark poster shows a visual representation of the contradicting current and desired ICU sound culture (see figure 34). Preferably – and ironically – the poster causes first rumours in the ICU corridors. The aim of the spark poster is:

- ◊ To confront nurses with how they all contribute to the ICU's sound environment and how it currently influences a patient's wellbeing
- ◊ To inspire nurses to perceive themselves as 'musicians', who are in control of a friendly sound environment for the patient and themselves
- ◊ To encourage nurses to have little chats about the contradictory visualisation of the current and desired ICU sound culture

The A2-sized spark poster shows a catchy cartoon of the current and desired ICU sound culture, involving the nurses, medical devices, and hospitalised patient. The image was based upon the visual metaphor that was created to concretise my desired vision upon the ICU sound culture (see section 4.1.2). The nurses in the cartoon use the medical devices as if it were musical instruments. In the current, 'dark' situation (left side), the nurses create acoustic chaos. In the desired, 'bright' situation (right side), the nurses create acoustic harmony. A text box with additional information explains the reader what the image is about, though it was deemed important to leave enough room for the reader's own interpretation. The main challenge during the poster's development was to create a catchy image that attracts the attention of all the different types of ICU nurses, by being both provoking and inspiring.

5.2.1 TONE OF VOICE

The provoking and inspiring image could cause different emotional responses when looking at the different types of ICU nurses (i.e. personas). Firstly, nurses who are not being aware of the sound (issues) (i.e. being ignorant) should be touched by the fact that the team is presented as sound-making 'musicians' and the visible (dis)comfort of the patient and some of the nurses. Secondly, nurses who are not willing to tackle the sound issues (i.e. being indifferent) should be touched by the negative emotions as well, but they also should recognize that these experiences really matter. Thirdly, nurses who feel discouraged in taking sound-reducing actions should feel that their intentions and experiences are acknowledged. The different emotional responses could be induced by one or more of the poster's elements, which were based upon the campaign posters created by the Dutch foundation SIRE (see appendix).

SIRE campaigns as inspiration
SIRE campaigns have a tone of voice that may fit the ICU audience. SIRE is an independent Dutch foundation that campaigns for important Dutch social issues, which they consider important to be given attention. Twice a year, they launch a campaign about a certain issue with which they want to "give people a wake-up call, encourage them to think, make difficult things discussable, stimulate debate and get people moving." (SIRE, n.d.)." Their messages are often a bit sneering and ironic, but funny and motivating at the same time. Especially their funny message may fit the nurses' characteristic of using humour (see section 3.2.5). Due to SIRE's mission and the way they bring about their messages, inspiration was taken from SIRE's posters of the past (see appendix G for examples of SIRE's posters, the elements they contain and how this knowledge was applied to the spark poster).

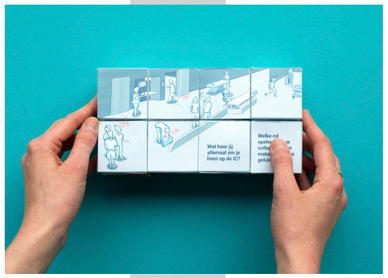
figure 34 – The spark poster, which should cause first rumours in the ICU corridor about the 'sound problem'.

5.2.2 PLACE, MOMENT AND TIME OF USAGE

The poster should be hung in a room where the clinicians only could come across the message, such as in a meeting or lunch room. The sight of the cartoonish nurses who seem to enjoy making 'music' through the medical devices might be too confronting for the patients and family members. The poster should communicate the message step-by-step in 3-30-300 seconds, following the steps of the AIDA model (from advertising, E. St Elmo Lewis, 1903) in order to create 'Attention', 'Interest', 'Desire' and 'Action'. Appendix G shows how the poster should grab the attention of the nurse and let him or her think about the 'sound problem'.

Who or what produces sounds in the ICU?

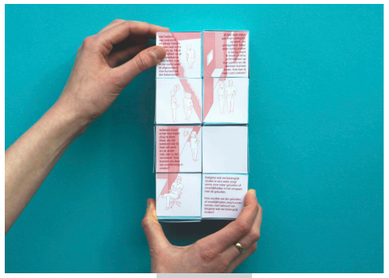
Field research (i.e. of this project) shows that nurses experience and cope with the sounds differently.



All nurses of the team contribute: through interactions with each other as well as the medical devices and other products in the physical environment, sounds are elicited in the ICU's corridor and patient rooms.

Nurses differ in how they experience the sound-inducing practices, varying from being angry, discouraged or astonished to feelings of not being understood.

figure 35 – The step-by-step story the user gets when rearranging the little cubes of the conversation cube.



Nurses experience difficulties with fulfilling these core values and, at the same time, reduce the sounds. How to overcome these dillemmas?

Not only the emotions put the nurses to action: they are also motivated by one (or more) of the core values of the team.

The content shown so far represents three types of nurses: the Opinionated Professional, the Assertive Ally and the Docile Novice. To which type(s) does the nurse belong to?

The emotions make the nurses act upon the sound-inducing practices: a nurse may reduce or accept the sounds.

5.3 · CONVERSATION CUBE

The conversation cube interactively presents more detailed information about the current ICU sound culture. The ICU nurses should use the tool in the first phases of the campaign: it makes nurses aware of why they need to change. The aim of the conversation cube is:

- ◊ To confront nurses with the fact that they differ in emotions and responses upon sound-related practices
- ◊ To trigger nurses to define to which nurse types they belong to
- ◊ To make nurses reflect on their personal 'underlying' drivers as well as those of colleagues
- ◊ To guide the nurses in their group discussion about sound-inducing/reducing practices and their effects upon the patient's and each other's wellbeing

The conversation cube is a foldable cube consisting of eight little cubes that can be rearranged by folding them in a particular way. Doing so enables the user to create eight different sides with a coherent image (see figure 36). When the user forms the 'right' images in sequence, he or she is exposed to a visual story step-by-step. During the development of the cube, attention was paid to the story's individual parts and the story as a whole.

5.3.1 TONE OF VOICE

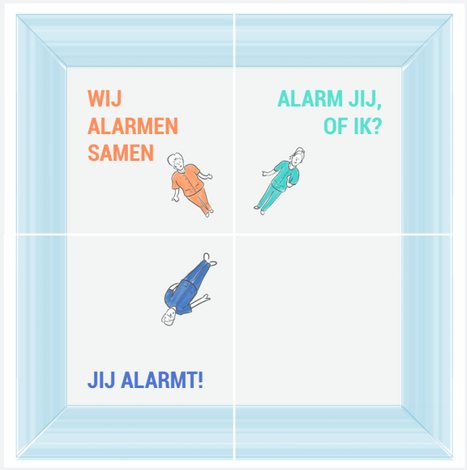
The message
The cube should mainly convey that nurses of one and the same team differ in how they experience and cope with the sounds, and where these differences come from. To let the nurses, as users of the cube, empathise with the different types among the team, the emotional responses and shared values of the created personas form a read thread through the whole story (each image of the cube was based upon results from the field research). The cube should be folded in such a way that it tells the visual and textual story about the nurses' sound-related experiences and issues, as can be seen in figure 35.

How the design supports the message
The conversation cube provides a playful interaction and visual step-by-step storytelling. As long as the user is able to navigate through the cube properly, the interaction will create a positive mood with feelings of fascination and joy. Lively visual representations of the ICU's physical environment, sound-related practices and the different types of ICU nurses should enhance this positive mood. Moreover, the visuals will enable the nurses to quickly recognize themselves in one ore more of the sound-related practices and personas. So, the lively appearance and the playful interactions should invite the nurses to exploratively reach deeper levels of knowledge step-by-step: the cube makes clear what they do, say and how the behave and which underlying emotions and values shape their behaviour.

5.3.2 PLACE, MOMENT AND TIME OF USAGE

The conversation cube can be used at different places and moments. The cube could be introduced to the nurses during a clinical lesson. The nursing team should be divided in groups of three (preferably representing different personas) that all receive a conversation cube. The cube should guide each group in their conversations about the sound (issues) in the ICU. In the weeks after the clinical lessons, the cube can be placed at a nursing desk as a cue to restart the discussion about 'sound (issues) in the ICU' or to invite a nurse to individually interact with it. Additionally, the cube could function as a physical reminder to pay attention to the sound-inducing practices again. So, depending on the ICU management team's or nurses' intentions – provoking group discussion, informing about the sound experiences, or reminding to reduce sounds – the conversation cube can be used in multiple situations.

figure 36 – (see next pages) The visual and textual contents of seven (out of eight) images. The numbers indicate the flow of the story.



1

Box(es) at bottom left mostly belong to persona 1.
Box(es) at top left mostly belong to persona 2.
Box(es) at top right mostly belong to persona 3.
It represents the segmentation shown in figure 19). It is not an absolute truth. A nurse can also share experiences of more or maybe all personas for example.

As said, findings from the field research were implemented in the cube. The practices shown in image two were for example retrieved from the observations and interviews. The two boxes at the bottom left show practices that persona 1 finds irritating: chatting colleagues, unneccessary sounds inherent to the products, or colleagues who do not put any effort in preventing them. The two boxes at the top left shows an upset persona 2 because of the buzzing left pager from a colleague and the open doors. The two boxes at the top right show persona 3: one who is paying a lot of attention to his pager and monitor, like a “control freak”, and the other one being overwhelmed by all the sounds from the beeping machinery in the room.

2

3

4

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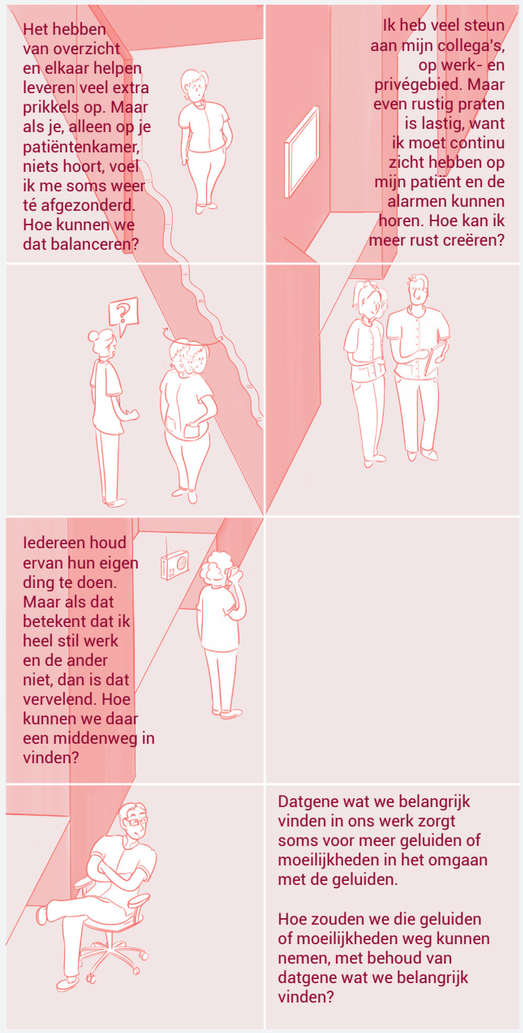


5.4 · SOUND CULTURA

The sound cultura is an interactive way of presenting the current and desired ICU sound culture and which opportunities are there for the ICU management team and nurses to change their sound culture. The team should use the tool in the last phases of the campaign: it makes the ICU management team and nurses aware of the fact that they can change the sound culture. The aim of the sound cultura is:

- ◊ To provoke nurses with the fact that they differ in value orientations and related practices, but that they share the same working environment
- ◊ To encourage nurses to collaborate in order to reduce the sound and how they could do so
- ◊ To inform the team about the 4 most important sound-inducing practices and how these practices are manifestations of the ICU sound culture
- ◊ To encourage the team to look for opportunities in their current ICU sound culture that could be changed

The sound cultura is an expandable flyer with a structure that fits the layered nature of a culture (see figures 37 and 38). When folded, the front of the flyer shows the main cultural group: the ICU nurses, who could be divided in three nurse types. When unfolding the front, the 'underlying' shared values are revealed. Additionally, it shows the (desired) practices that take shape in the form of 'symbols', 'heroes', 'rituals', as explained by Hofstede's onion model (Van Boeijen, 2011) (see section 1.4.2). The backside of the folded flyer shows the four main sound sources that could be observed: alarms, speech, incidental and background sounds (Redert, 2018). When unfolding the backside step-by-step, the user is triggered to think about the emergence of these practices in his or her own ICU, which is guided by the nine cultural aspects described by Hao, Van Boeijen, & Stappers (2017). All in all, the expandable sound cultura flyer shows observable aspects of the sound culture as well as latent and tacit knowledge about the current and desired ICU sound culture when unfolded.

5.4.1 TONE OF VOICE

The message

The sound cultura should mainly convey that the team only can change the sound issues when all members put effort to it and when supporting each other in doing so. Though the flyer should encourage and motivate nurses to participate in this collective sound cultural change, it also expresses the importance of considering the nurses' shared core values and needs, and their differences in core value orientations. Their concerns, needs and wishes are shown as well. The content was based upon results from the field research, in particular the created flyers representing the personas. See figures 39 and 40 for more explanation about the visual and textual contents of the (unfolded) front and back side of the flyer.

How the design supports the message

Besides the fact that the design of the sound cultura flyer fits the layered nature of a culture, the design fits the vision of moving towards a more collectivistic sound culture too. When unfolded, the desired ICU sound culture is visible: nurses should collaborate in the ICU as a shared working and healing environment. When unfolding, a surprising moment occurs: there is literally and figuratively a distance between the them – the current ICU culture. The flyer's informative and encouraging content should move the nurses to the core of the desired ICU culture: work together towards a more peaceful sound environment, considering the shared core values and the needs of every individual nurse.

5.4.2 PLACE, MOMENT AND TIME OF USAGE

Just like the conversation cube, the sound cultura flyer can be used at different places and moments. The flyer could be introduced to the nurses during a 'generative' clinical lesson. The nursing team should be divided in groups of three (preferably representing different personas) that all receive a flyer. The flyer should trigger them to discuss their needs and the message of working together. Later on, in another lesson, the groups should think of concrete ideas of tackling the sound issues (such a session should probably be guided by a 'trained' creative facilitator). After introducing the flyer, the flyer can also be used when a specific (sound-related) conflict happened between different types of ICU nurses. Nurses themselves can consult the flyer and determine how they actually could (have) help(ed) each other, or the management team can quickly interpret the conflict by knowing what types of nurses and concerns were involved. So, the flyer can be used in early and later stages of the process of sound cultural change.

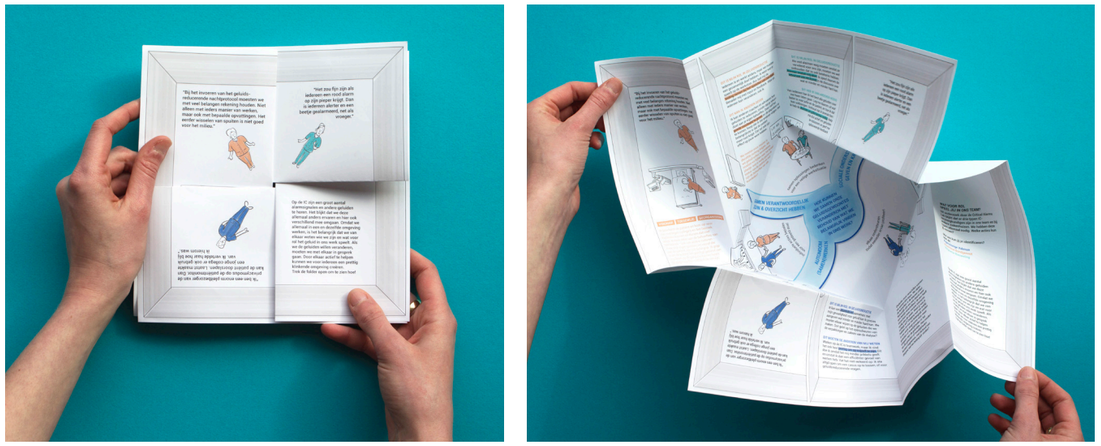


figure 37 – The folded front side (left) shows the collectivistic ICU nursing team . When unfolded (right) the shared, core values are revealed.

figure 38 – The folded back side (left) shows the four main sound sources in the ICU. When unfolded (right), the user is asked sound culture-specific questions.

figure 39 – The visual and textual contents of the front side of the flyer when (un)folded.

Because the different types of ICU nurse share the same working environment but differ in how they experience and cope with the sounds, the nurses need to come together and share their experiences and needs. They should create a collective sound culture.

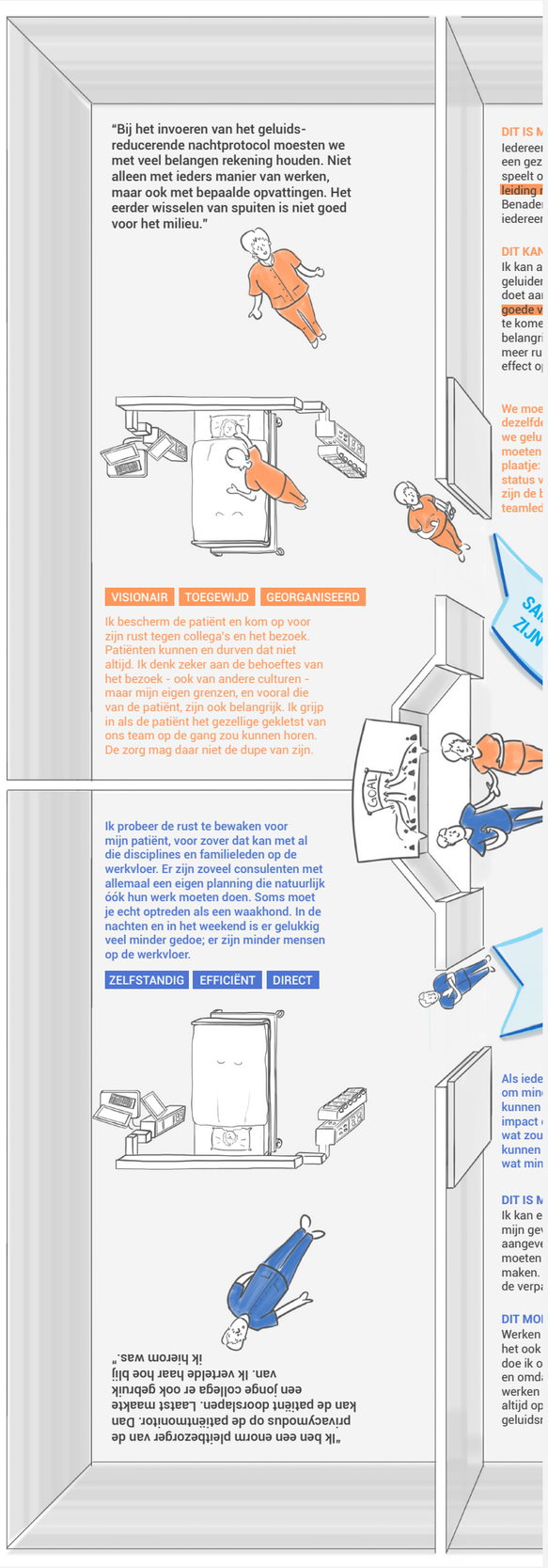
unfolding the flyer

SHARED CORE VALUES 1
The nurses share certain core values, or things they find important in their job. They differ in core value orientations, for example: working autonomously (together) is highly shared by persona 1 (the 'purple' nurse).

TASK AND GOAL 2
The nurses are triggered to rethink their sound-related practices, while considering their shared core values and personal needs.

SUB-GOAL: SUPPORT EACH OTHER 3
Each nurse type (persona) should team-up with another nurse type and take actions in which he or she is good at or has an interest. Through the conversation cube, nurses could identify to which nurse type they mainly belong to.

PERSONAL CHARACTERISTICS 4
Each nurse type has important aspects to consider when the team wants to reduce sounds. Besides, each of them could take a particular role during the process of change, while paying attention to their concerns, potential ideas or wishes.



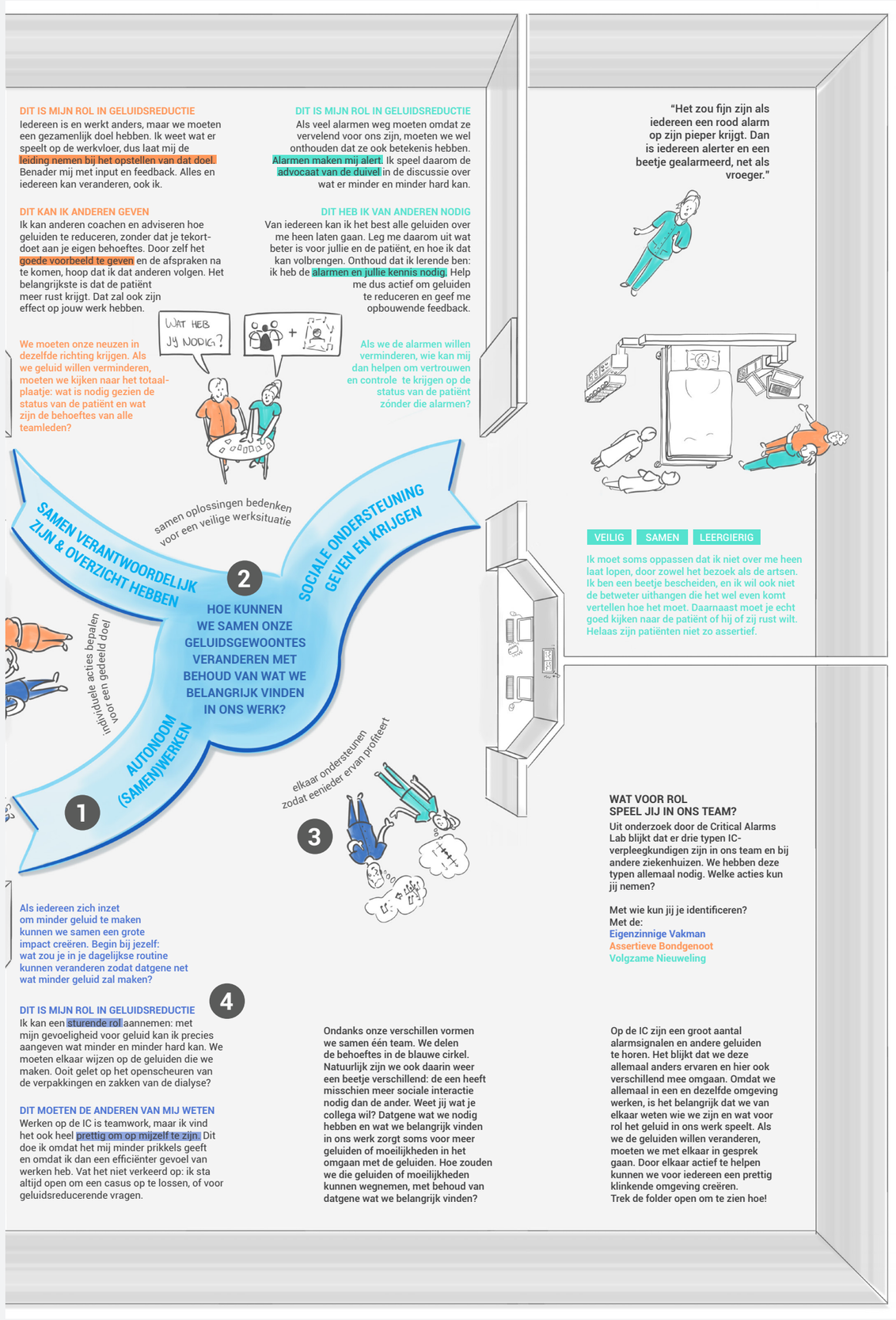
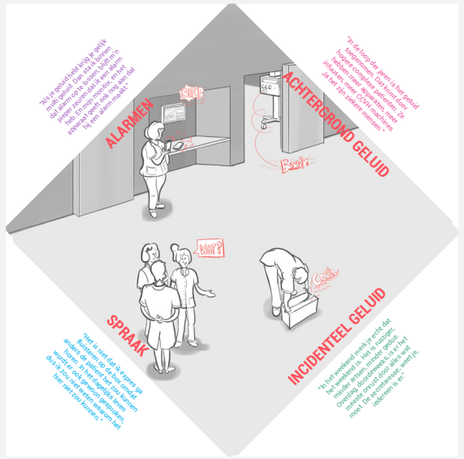


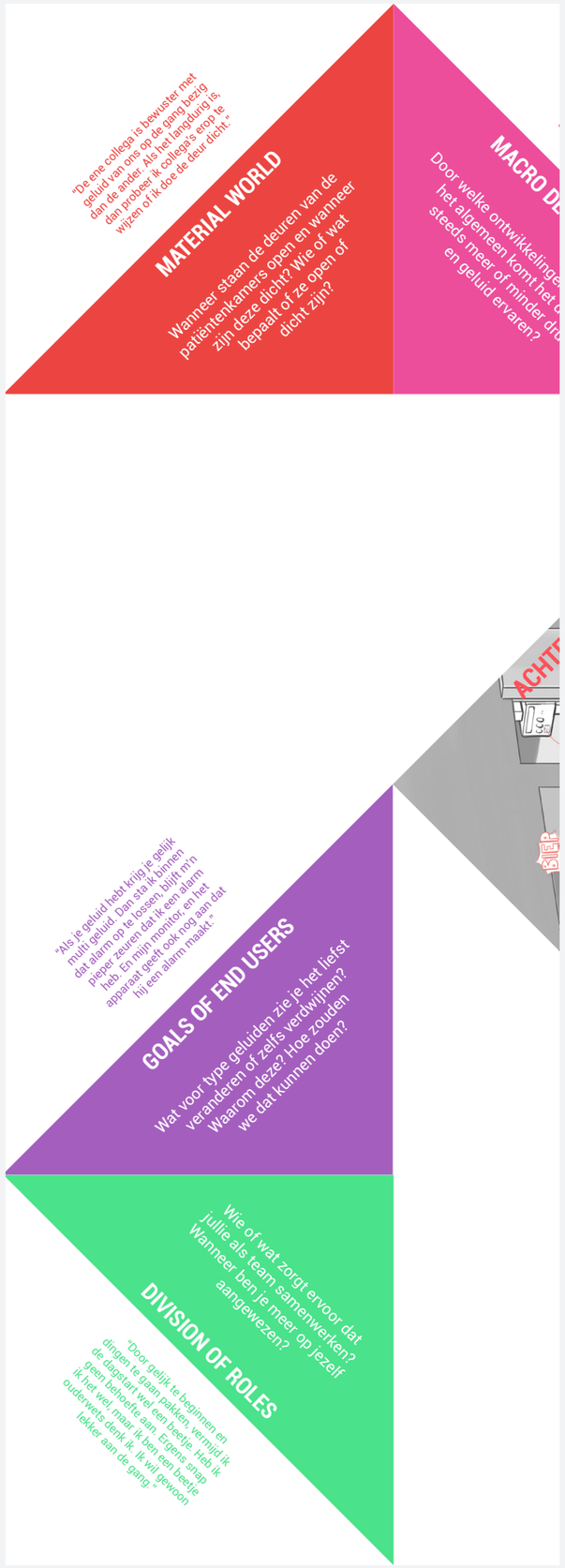
figure 40 – The visual and textual contents of the back side of the flyer when (un)folded.



Through interactions with each other as well as the medical devices and other products in the physical environment, sounds are elicited in the ICU's corridor and patient rooms. These sounds could be categorized in four groups: alarms, speech, incidental and background sounds (Redert, 2018). The four visible quotes show experiences from the ICU nurses who participated in the field research.

unfolding the flyer

The sound-related practices could be caused by different aspects in the ICU's current sound culture. These aspects are categorised in eight groups, based on the nine cultural aspects described by Hao, Van Boeijen, & Stappers (2017). What does apply to your ICU?



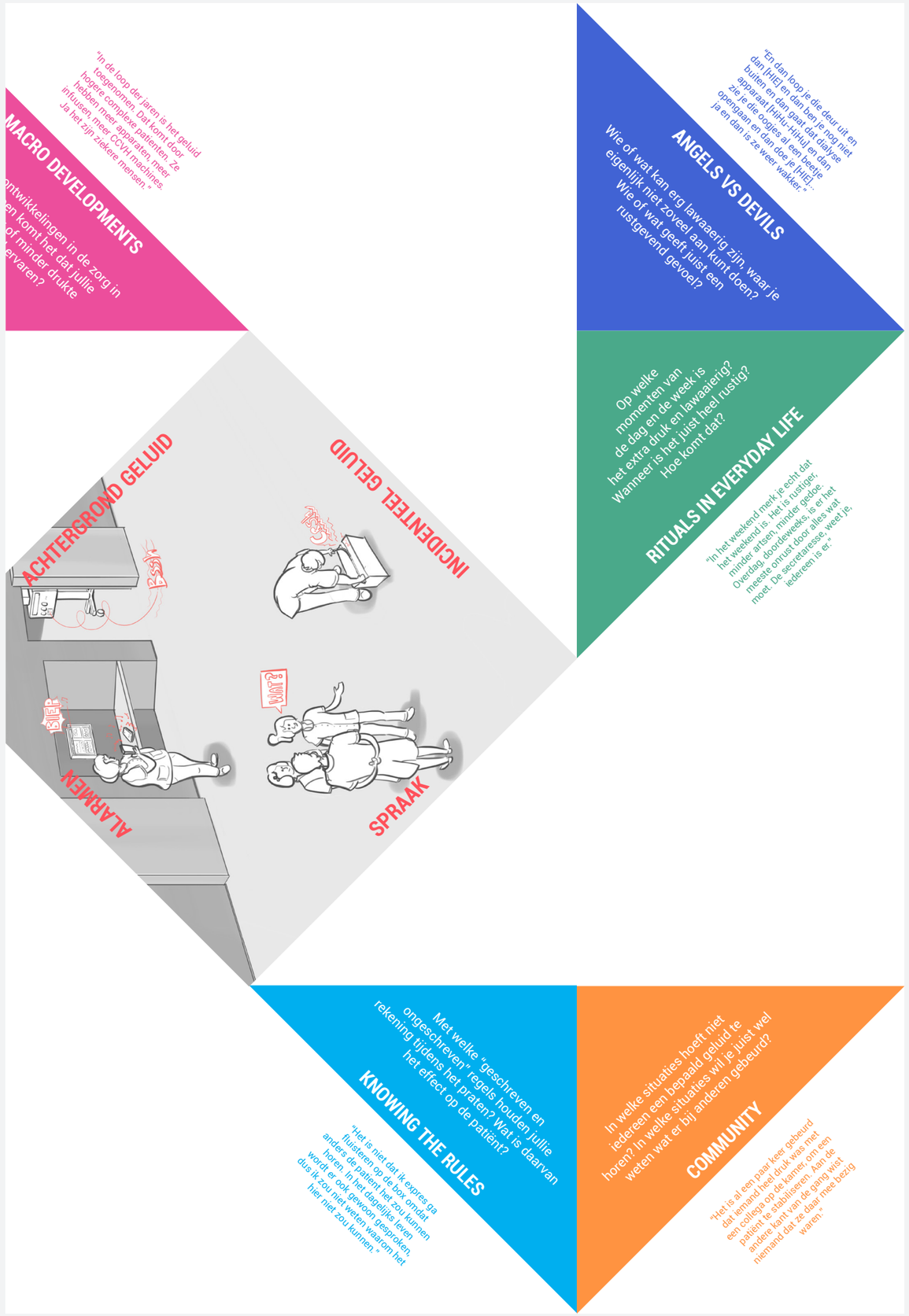


figure 41 – A nurse at the Adult ICU at the Erasmus Medical Center tried out CareTunes during an exhibition of the Critical Alarms Lab at their department. CareTunes is a future patient monitoring system that uses music instead of beeping alarms. The design interventions give nurses an idea of how the environment and their activities could take shape.

figure 42 – A nurse at the Adult ICU at the Erasmus Medical Center showed her concerns about the usage of Doplor, which is a design intervention created by Redert (2018). A nurse at the Adult ICU at the Erasmus Medical Center tries out CareTunes during an exhibition of the Critical Alarms Lab at their department. It is expected that the campaign will support nurses in seeing the need and opportunity for implementing such products.

figure 43 – Evaluation with the nursing team lead of the Adult ICU at the Erasmus Medical Center. The created personas from the field research, and prototypes of the conversation cube and sound cultura flyer were discussed, with regards to what she, as a manager, and her employees need.

5.5 · EVALUATION OF THE CAMPAIGN TOOLKIT

5.5.1 THE LIKELIHOOD OF USING IT

The sound cultura and conversation cube were quickly evaluated with respectively the nursing team lead and the nurses working the ICU of the Erasmus Medical Center (see figure 43). Their experiences and feedback were taken into account when finalizing the tools. The nursing team lead expressed her interest in understanding the different types of ICU nurses shown in the flyer, not only for tackling the sound issues but also for team dynamics on the work floor in general. Her main question was to incorporate information about how the different nurses could help each other. When evaluating the conversation cube with the nurses, it became clear that the information touches them: it provoked discussion about individual preferences and some nurses immediately recognised themselves in one or more nurse types. So, the evaluations showed that the tools were a first good step in creating 'sound-issue-awareness' and answering the question of how to make nurses 'behave sound-consciously'.

Besides the intended effect and interesting response of the nursing team lead, it is expected that (nursing) team leads of other ICUs see the added value of the campaign (tools) as well. The participating ICUs of the field research, for example, showed their interest in tackling the sound problem from a cultural perspective already: it was apparent that all approached contact persons (such as an intensivist or nurse) were immediately interested in the subject. It seemed that they are aware of the sound issues and the clinicians' sound-induced behaviour, but do not have the means to change them. Additionally, they were often curious to the perspective of a design researcher "who is not familiar with and not a member of the cultural group" in the medical field (Van Boeijen, 2011). Because of these aspects, together with the fact that sound issues in the ICU are a universal problem, it is expected that not only these participating ICUs but also other ICUs will see the benefits of using the campaign toolkit.

Though the toolkit will be offered to teams who observe that sounds are an issue and know their negative consequences on the patients' and nurses' wellbeing, it is also possible that a particular team took some first communal sound-reducing steps already. This was the case for one of the participating ICUs. The interviewees working there expressed the importance of reminding each other about the sound-reducing night protocol every now and then, because they and their colleagues do not comply with the agreements in the protocol sometimes. Therefore, the toolkit will still be valuable for teams who are already further in the process of creating 'sound-issue-awareness' and acting upon that. Especially the knowledge about how nurses differ in how they experience the sounds and cope with them is probably ground breaking.

5.5.2 TO CONCLUDE: WHY DO ICUS NEED THIS CAMPAIGN?

To conclude this chapter, I would like to give one strong example that shows the need for and potential added value of the campaign. This example involves the Critical Alarms Lab's exhibition of their design interventions in the ICU department of the Erasmus Medical Center, in which the nurses could experience the design interventions themselves (see figures 41 and 42). Unfortunately, some nurses showed quite a sceptical attitude: they quickly saw negative consequences of the design interventions upon their core values. Exhibiting or letting nurses experience the design interventions could still be a good way of showing the sound issues and how these could be tackled, but it is advised to bring them more nuanced (both from a positive and negative perspective) as well as when the mindset is more 'open for change'. It emphasis the need for a creating 'sound-issue-awareness': the campaign could support nurses in being more 'open' for the Lab's interventions that tackle the sound issues in the ICU because nurses might see the purpose and positive impact more than they currently do.

06

EVALUATION OF THE PROJECT

Generally speaking, the project consisted of two phases: a field research phase and a design phase. This final chapter shows my (personal) reflections upon the execution of the field research and the development of the campaign toolkit in particular. Firstly, the limitations are shown: different challenges, which are often experienced by design researchers in healthcare (Groeneveld et al., 2019), have changed the initial plan and approach of the field research. The development of the campaign toolkit faced some limitations as well. After discussion of the limitations, the recommendations and other opportunities for future research and design projects in the context of an ICU will be discussed. This chapter will be concluded with reflections on a more personal note, involving my experiences with the cultural-conscious approach and contextmapping techniques applied.

6.1 · LIMITATIONS

6.1.1 LIMITATIONS DURING THE FIELD RESEARCH

No involvement of ICUs abroad
Initially, internationally different hospitals were going to be benchmarked in order to typify different sound cultures and to distinguish local culture-specific practices from global ones. Despite the contact made with different hospitals in the United States, research abroad was eventually not conducted. First of all, the nurses' availability was limited due to time and cost restrictions – a challenge that is often experienced by design researchers in healthcare (Groeneveld et al., 2019). Secondly, the administrative burden and the long wait for approval from the institutional review board would take too much time and effort. It seems that American ICUs are much more protective than Dutch ICUs, because observations and interviews were quickly arranged once a Dutch ICU was on board after intensive efforts of communicating the value of this project and the involvement of a design researcher on the work floor. I therefore chose to include more Dutch ICUs than planned, so that a comparison between them could be made.

Difficult adaption to dynamic nature of ICU
During the observations, difficulties arose with the dynamic and sometimes hectic nature of the ICU. As an outsider and newcomer, who was not familiar with that particular ICU culture, it was hard to interpret to what extent I could involve myself in the team's activities. This was especially true during peak hours and unexpected, hectic circumstances. I did not want to be a hindrance, which might harm the nurses' and patients' wellbeing. "Exchanging expectations and possibilities and reaching agreement prior to fieldwork" might be a good step to take in future fieldwork, although it is again often experienced as a challenge when doing design research in healthcare (Groeneveld et al., 2019).

Witnessing harmful situations
A last challenge, which Groeneveld et al. (2019) states as well, is the confrontation with distressing situations and the possibility of witnessing death. Situations occurred in which I had to protect myself and take distance from the situation. During my very first observation in the patient room, I almost fainted – the sight of a very vulnerable patient grabbed me and became almost too much to process. These situations, involving strong negative emotions, of course interrupt and influence the observational process.

Scattered type of participants
The six participating ICUs differed a lot from each other (varying in the ICU's physical layout, nursing team size, and patient population). This was partly caused by the fact that collecting contacts in the privacy-sensitive healthcare domain made the recruitment time-consuming and difficult to control. Therefore, the six participating ICUs were arranged on a 'first come, first serve' basis: the approached ICUs who responded quickly and with interest were often accepted as participants. Though the small number of scattered participants (ICUs and its nurses) may violate the validity of the research, the variety of participants was seen as a benefit for this project: it enabled me to discover typical aspects for each ICU but also the nurses' shared values and practices.

Variety in observations
The observations during the field research vary in how they were executed. Each observation in an ICU was different from the one before in terms of the observational roles taken, the moment of observing (in the morning, afternoon or evening) and time spent. Taking different observational roles was done consciously, but other contextual factors and the ICU's dynamic circumstances made me switch roles on the spot too (see section 3.1.1). This, added to the fact that some ICUs were only observed in the morning or only in the afternoon (whereas the morning and afternoon routines differ a lot), may have influenced my impression of a certain ICU sound culture.

6.1.2 LIMITATIONS DURING THE DEVELOPMENT OF THE CAMPAIGN

The mission of moving towards a more collectivistic sound culture and the campaign tools that could support ICUs in doing so were highly derived from the findings of the field research. However, I mainly developed the strategy (by) myself, so my own values and beliefs could be present as well. This, added to the fact that the campaign tools' prototypes were evaluated with people present in one ICU only, and the fact that I was unable to measure the actual impact, limits the applicability and validity of the campaign and its mission.

Minimal evaluations
Due to the limited amount of time and resources, the tools were quickly evaluated and developed. The campaign tools and their goal to create a more collectivistic sound culture were only evaluated with the nursing team lead and the nurses working in the ICU of the Erasmus Medical Center. Though the physical form of the final tools did not change much compared to the prototypes of the evaluation, the tools' contents were influenced by the team lead's and nurses' experiences and feedback. In the future, the tools should be evaluated with more management team members and nurses (differing in types), coming from different ICUs, in order to investigate the usage and experiences and the likelihood of using them.

No measurement of the impact
The sound cultural change through usage of the campaign will take time (approximately half a year or more, depending on how rigorous they want to change; (personal observation, December 4, 2018)). The actual effect of the change of minds and behavioural change among the nurses can only be measured after a period of time. Though the nursing team lead of Erasmus MC shared the vision of creating 'sound-issue-awareness' and agreed on the added value of using the tools, I cannot say anything about the actual applicability, impact and validity of the campaign and its mission as a whole.

6.2 · RECOMMENDATIONS

6.2.1 RECOMMENDATIONS FOR FUTURE FIELD RESEARCH

Investigate the problem from other's perspective
In this project, the sound issues were addressed from the perspective of an ICU nurse, but it would be interesting to address the problem also from the perspective of other people present in the ICU. First of all, the field research showed that physicians might influence how nurses (need to) cope with the sounds. Besides, many nurses expressed that family members or even the patients play a role in the production of sounds as well. Another point of view could be to look at the negative effects of sound or the positive effects of silence upon the patient's wellbeing. These insights, which are gathered by a student of the Critical Alarms Lab recently, could be incorporated in a current or new campaign tool that should make nurses aware of the fact that they need to change . By incorporating multiple perspectives of people present in the ICU, the understanding of the ICU sound culture will be broadened.

Investigate 'the change of atmosphere'
The field research showed that the atmosphere in the ICU's corridor loosens up in the evening and night shifts, as well as in the weekends. Some nurses mentioned that they might become more chatty due the decrease in social control of family members, physicians and managers, but it would be interesting to further investigate where the change comes from and how it influences the sound (level) and the patients' and nurses' wellbeing.

Incorporating a bigger variety of ICU types
During interviews, other types of hospitals or ICUs and their implications for the ICU (sound) culture were discussed sometimes. For example, some nurses estimated that nurses working in a hospital with a (strong) religious background may have different manners when it comes to personal care and using humour towards the patients, families and colleagues. Additionally, some nurses stressed that the complexity of the patient population (this project: level 3 ICU, see section 2.1) causes their particular ICU to be an (acoustically) dynamic working environment. This, together with the fact that the patients' complexity is increasing over the years (personal observations, December 4, 2018) and macro developments such as personnel shortages and 'bed pressure', elicits the opportunity to incorporate a bigger variety of ICU types in future field research. It would be interesting to look at how ICUs, big and small, academic, regional, or with a strong religious background, differ from each other regarding their sound culture.

Going from local to global
It would still be valuable to go 'from local to global' and to discover similarities and differences between Dutch and international ICUs. This way, the 'Dutch' ICU sound culture could be further validated: local culture-specific from global practices could be distinguished. The campaign toolkit (translated into English), with the conversation cube in particular, can be used as an 'interview guide' in order to elicit reaction from the nurses or other people present in the ICU. This way, the interviewer might reach deeper levels of knowledge quicker, because he or she is already addressing the meaningful topics (instead of the approach during this project, which was more of an explorative interview about the ICU culture, looking for (sound-related) topics that matter to the interviewee). The main question is: do the nurses abroad share the same values and practices?

How nurses could cope with the sounds
The campaign tools trigger the nurses themselves to think of new ways to cope with the sounds that are induced by the medical machinery and their own behaviour. Future research could elaborate on how nurses actually could and should cope with the sounds. The personas and sound cultura can help to determine concrete steps that nurses could take to cope with the sound, taking into account their routines, beliefs, rules and regulations or other things in the physical environment. These insights could again be added to the sound cultura, so that the tool not only asks nurses to look for opportunities themselves but also give some concrete, validated steps to start from.

6.2.2 RECOMMENDATIONS FOR THE CAMPAIGN AND OTHER DESIGNS

Adapting to potential other users
Though the campaign tools will mostly be addressed to the ICU management team and nurses, the tools could also be used by equipment producers and industrial design engineering students from knowledge institutes such as the Delft University of Technology (Özcan, Birdja, & Edworthy, 2018). Though the contents of the tools should be adapted so that they could easily be integrated in the design process, I expect them to be valuable for understanding the context they are designing for. With this understanding, the researchers and designers of the Critical Alarms Lab could for example tune their current design interventions to the ICU nurses' shared core values and needs. Another opportunity for the Critical Alarms Lab is to change its tone of voice on the website, social media channels and exhibitions so that the Lab shows the purpose of changing sound-related practices – that is, improving the patient's and nurses' wellbeing – and intrinsically motivates nurses to do so. In this way, the campaign's manifesto and tools could also be used by stakeholders outside the physical ICU context who aim for sound cultural change.

When the tools are addressed to equipment producers and industrial design engineering students, it would be valuable to add a clear set of guidelines for future designs in the context of an ICU, both product and architectural design. These guidelines could specifically describe the desired sound-related interactions between people and their physical surroundings, taking into account the different types of nurses (and preferably, other people present). An example of such a guideline is

to integrate a beginner, intermediate and advanced mode in a particular medical device in order to provide the fitting support for each nurse type. The guidelines could give producers and designers concrete starting points or they could be used as a checklist in further stages of the design process.

Recommendations for the tools as they are now

◊ Experiment with the tone of voice for the campaign in general and for each tool: is the message clear and what emotions and reactions does each tone of voice cause upon the nurses?

◊ Create a complete package of the campaign, that could be easily distributed among hospitals in the Netherlands and abroad.

◊ Find a way in which ICUs could learn from the sound-related practices at other ICUs. I made a table of practices (showing similarities and differences between ICUs), but the way it is presented now is not inviting to read.

6.3 · CONCLUSIONS

The aim of the project was twofold: (1) capturing and typifying different ICU sound cultures and (2) looking for opportunities for silencing down the ICU whilst considering the sound cultures.

The first aim, capturing and typifying different ICU sound cultures, was addressed in a field research study with a procedure based on contextmapping. The research findings showed that nurses working in the same Dutch ICU and nurses working in different ICUs share three (sound-related) core values: autonomously working (together), being situationally aware and giving and receiving social support. It seems that the accompanying practices are transmitted through learning and typical for the Dutch ICU (sound) culture. However, nurses from different ICUs but also nurses of one and the same team could differ in their value orientations and practicing these. As a result, the nurses can be divided into three types based on shared customs, beliefs and needs, called 'personas'. The field research showed that similarities and differences exist due to ICU specific sound cultures and ICU specific group cultures within one and the same team. In future research, it would be interesting to validate the personas among the ICUs who participated in this project, but also among nurses working in other (types of) ICUs (such as a small regional hospital), in the Netherlands or abroad.

Though different sound cultures and coping strategies with the sounds exist, there is a commonality regarding the 'sound problem': in all ICUs, the sounds, or even issues with them, are sort of accepted to a greater or lesser extent due to nurses not knowing why (by being ignorant or indifferent) or not knowing how to reduce sounds. Additionally, the current sound-reducing efforts are often taken individually, ad-hoc and helpful on a short-term. When ICUs want to reduce sounds with a bigger impact in the longer term, ICUs need to create 'sound-issue awareness' and motivate every individual nurse to act upon the sound issues.

This opportunity for silencing down the ICU whilst considering the sound cultures, which was the second aim of the project, was further translated into a campaign for sound cultural change. The campaign challenges the ICU management team and nurses to establish a 'collectivistic sound culture' through a top-down and bottom-up approach. It consists of three practical campaign tools – the spark poster, conversation cube and sound cultura – that trigger the ICU nurses to see the need for change and how they can reduce noise with their own behaviour and resources, while paying attention to their shared and personal core values.

The three campaign tools all support the general message of "work together towards a more peaceful sound environment, while considering the patient's needs and those of every individual nurse". The first tool (spark poster) focusses on the first part of the message, the second tool (conversation cube) on the different (sound-related) experiences and needs of the three types of ICU nurses, and the third tool (sound cultura) on how the nurses could work together and support each other in sound-reduction. Especially the conversation cube and sound cultura express that the nurses' core values and needs need to be considered when moving towards a more collectivistic sound culture.

Evaluations with the nursing team lead and the nurses working in the ICU of the Erasmus Medical Center showed that the tools are first good steps in making the ICU management team and ICU nurses aware of the 'need for change' and that 'they can change'. The conversation cube triggered nurses to discuss their sound-related experiences and needs. The sound cultura seemed to be an inspirational means for management teams to understand their employees and to support them in how to cope with the sounds and sound-making colleagues. However, the campaign's vision, strategy and the practical tools need to be further evaluated over time in order to conclude whether they have the right effect for silencing down the ICU and creating a more peaceful sound environment for both the patients and nurses.

When looking back at the twofold aim of the project, it can be concluded that this project provided a good basis for understanding the ICU sound cultures and how this understanding could help in looking for opportunities for silencing down the ICU. The term 'sound' could actually be put between brackets: 'ICU (sound) cultures'. The values and practices that were brought to the surface are part of a 'broader' ICU culture. A value such as 'being efficient' not only shapes sound-related practices, such as the efforts taken in limiting unnecessary alarms, but also practices such as limiting the amount of time dedicated to reporting. So the captured core values of ICU nurses that have an effect on the sound-related values and practices of the ICU sound culture are part of a 'broader' ICU culture. Therefore, the understanding of the ICU (sound) culture not only forms an inspirational means for tackling the sound issues but also for other organizational or technological change, either induced by designers, the ICU management team or nurses themselves.

6.4 · PERSONAL REFLECTIONS

One of my personal ambitions for this graduation project was to explore an unfamiliar world for me personally. The context of an intensive care unit made this certainly possible. When I entered the ICU of the Erasmus Medical Center for the first time, the serenity made me hold my breath for a moment. Ironically, the clinical appearance and the brightly lit corridor exuded some sort of calmness. However, after a while, I noticed that the context was dynamic and sociable: monitors were beeping, pagers were buzzing, people were walking in and out and clinicians approached me with interest. The welcoming clinicians helped me in adapting myself to the unfamiliar environment. Their genuine interest in my research topic and their willingness to include me in their work activities truly motivated me to extensively observe the context and step into their shoes.

I imagined my graduation as an extension of my internship at service design agency Muzus (Delft) where I put contextmapping into practice. During the internship, I gained experience in developing research materials (such as the sensitising booklets), gaining empathy with the participants during observations and interviews, conducting analysis on-the-wall, and creating effective communication means to share the gathered insights. All the skills were of value during this explorative graduation project. Additionally, the project showed once again that contextmapping is an excellent method to reach deeper levels of knowledge about the end users in a particular context.

The cultural-conscious approach taken was of added value as well. It was the first to time for me to use the tools created by my supervisor Annemiek van Boeijen and her PhD candidate Chen Hao. Their playful and easy to use tools immediately helped me to immersive myself in a cultural context and to approach matters more from a 'group perspective' instead of an individual one. Doing so, gave me a good understanding of how people's behaviour is highly shaped by the beliefs and needs of other people around them and the physical world in which the people interact. Though I took first attempts in visualising the current and desired ICU sound culture, the following challenge remains: as designers, we all have an idea of what a persona – as an individual representative of a group – should look like, but how could we effectively communicate a cultural context?

Due to the contextmapping method and cultural-conscious approach, I addressed the topic with curiosity and an open mind. A struggle I am still dealing with relates to the advice that my supervisor of the bachelor end project gave me already: "strive for insights, instead of completion". However, apparently I managed and I am proud of the amount of work and how all the pieces fell into place eventually. I believe in the gathered insights and the developed campaign tools, so I would love to work further on the implementation of the campaign. Hopefully, Elif Özcan Vieira, one of my supervisors and director of the Critical Alarms Lab, and I could create a positive impact on the ICUs' sound cultures.

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APPENDICES

The appendices of this report can be found in a separate document.

The following appendices are included:

A. Project brief

B. Card set 'crossing-cultural chasms' (Van Boeijen, 2011)

C. Nine cultural aspects (Hao, Van Boeijen, & Stappers, 2017)

D. Interview questionnaire

E. Emotion Capture Cards (Ozkaramanli, Fokkinga, Desmet, Balkan, & George, 2013)

F. Sociocultural dimensions in the ICU

G. Ideation spark poster