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Buddies on the Road

Improving long haul truck drivers' leisure time

Master of Science in Interaction Design and Technologies

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Abstract

This thesis consisted of improving long haul truck drivers' leisure time, when they are in the truck cabs, with the design of an interactive product. The thesis was initiated by Volvo Group Trucks Technology to get to know and understand European long haul truck drivers' needs when they are not driving but have to stay in the trucks. The methodology was comprised of finding user needs, defining a design challenge in which three concepts were developed, and finally evaluating those alternatives to develop one final concept that fulfills the thesis goal. The design process followed a Human Centered Design (HCD) approach to be able to empathize with the users, and was aligned with the Design thinking model which consists of five different spaces to move within to be able to iterate and refine solutions. The thesis was divided into three main phases, and each culminate with the delivery of a result. The user research involved 70 participants from different European countries and from the data gathered, it was concluded that long haul truck drivers have the needs of: social contact, being able to enjoy their hobbies, disconnect to be able to relax and time efficient tools when they are in the truck cab. From those needs a design challenge related to helping users to disconnect from work was defined. Three concepts, based on the design challenge, were developed, tested and later combined into one. Finally, the concept 'Buddies on the Road' was developed. It is a tablet application where truck drivers can build a network to interact with others by inviting people nearby to explore places together, challenging friends to exercise and by conversing about a topic of interest. The different activities that are offered that help truck drivers to disconnect from works are: exploring nature, meeting people, changing environment and exercising. In addition, the 'Buddies on the Road' concept was tested by truck drivers and was later refined. However, it needs further development to improve the design of the graphical interface, the usability considering truck drivers' safety (if used when driving) and field tests to evaluate it in a real context.

Keywords: Long haul truck drivers, Leisure time, Human centered design, Design thinking model, Disconnect from work, Tablet application.

Sammanfattning

Detta examensarbete består av att förbättra fjärrtrafiksförarens fritid i lastbilshytten genom en interaktiv produkt. Examensarbetet gjordes på initiativ av Volvo Group Trucks Technology för att få förståelse för lastbilsförarens behov då de inte kör men är bundna att stanna kvar i lastbilen. Metodiken innefattade att identifiera europeiska fjärrtrafiksförarens behov, definiera en designutmaning som tre koncept utvecklats för att besvara, och slutligen utvärdera dessa koncept för att utveckla ett slutligt koncept som uppfyller examensarbetets mål. Arbetet följde en Human Centered Design (HCD) metod för att interagera empatiskt med användarna och få bättre förståelse av deras behov. Designprocessen som följdes var "Design thinking model" som består av fem olika faser att upprepa för att utveckla lösningar. Examensarbetet delades upp i tre huvudfaser som var och en avslutades med ett resultat. Användarundersökning involverade 70 deltagare från olika europeiska länder. Från den ihopsamlade datan drogs slutsatsen att fjärrtrafiksförarens behov är att: ha social kontakt, kunna njuta av sina fritidsintressen, kunna slappna av, koppla bort arbetet samt att ha tillgång till tidseffektiva hjälpmedel när de är i hytten. Från dessa behov skapades en designutmaning relaterad till att hjälpa användare att koppla bort arbetet. Baserad på designutmaningen utvecklades och testades tre koncept som senare kombinerats till ett. Slutligen utvecklades verktyget "Buddies on the Road" vilket är en applikation till en surfplatta där lastbilschaufförer kan bygga upp ett nätverk. Några av de handlingar de kan göra för att interagera med andra lastbilschaufförer är att; bjuda in de i närheten för att utforska nya platser tillsammans, utmana vänner att träna samt att tala om ett speciellt ämne eller intresse. De aktiviteter som erbjuds är att utforska närområdet, träffa människor, få miljöombyte och träna, för att hjälpa dem att koppla bort arbetet. Konceptet 'Buddies on the Road' har testats av lastbilschaufförer och förbättrats utefter återkopplingen som gavs. Dock behövs ytterligare utveckling för att förbättra det grafiska gränssnittet, användbarheten angående lastbilschaufförers säkerhet (om användande under körning) samt fler fältstudier för att prova appen i sin egen kontext.

Nyckelord: Fjärrtrafiksförare, Fritid, Human centered design, Design thinking model, Koppla från arbetet, applikation till surfplatta.

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1

Introduction

This chapter describes in detail the research objectives that this thesis aims to fulfill. It presents the purpose and the scope (defined according to available resources), introduces the stakeholders and authors involved, and ethical considerations that the final design should have.

Long haul truck drivers usually spend several days or weeks on the road, working and living in their trucks and being away from their homes due to work demands. This research aims to improve their lives and living conditions in the truck, by offering an option that improves their free time and brings balance to their working/leisure time.

Allowing truck drivers to have more enjoyment during their time on the road is of great importance to look into. Not only for the benefits that can be bring to truck drivers but also to society in general, whose safety gets affected by sharing the same road they drive by. In addition, having facilities that are concerned with truck drivers' enjoyment could make a truck driving career more appealing to other people.

Offering safety and comfort conditions to truck drivers' work and living environment in the truck have been a point of focus within Volvo Group Trucks Technology (Volvo Truck Corporation, 2014). When it comes to entertainment options while truck drivers are not driving, truck cabs currently do not offer many alternatives to choose from. Therefore, Volvo Trucks is interested in knowing what truck drivers need, related to entertainment or when they are not driving in general. This thesis presents a thoroughly user research to identify long haul truck drivers' needs and the development of a concept that will help them enjoy their free time while staying in the truck.

1.1 Project Goal and Research Questions

This thesis aims to research on long haul truck drivers' leisure time in the cab, identify challenges and needs that they experience and meet those needs with the design of an interactive product that brings enjoyment to their lives. The final design should improve the quality of their leisure time spend in the cab, hence the

following research question was defined:

What interactive product can improve truck driver's leisure time while they are in the truck cab?

To be able to answer the main research question, the following supportive research questions were also defined:

- What do truck drivers need to be able to enjoy their leisure time in the cab?
- In which three ways can truck drivers' needs be fulfilled to improve their leisure time in the cab, according to the stakeholders?

This thesis presents three results, each answering a research question. The first result is truck drivers' needs (related to enjoying their leisure time in the cab). The second result is the description of three concepts and each of them aims to address a design challenge defined from the user needs. The final result is a concept that answers the main research question, meets the stakeholder's criteria and requirements, it also provides a solution to the design challenge.

1.2 Delimitations

This project had a duration of twenty weeks, hence the following delimitations were defined to be able to meet its objectives considering available resources:

- This thesis focused on designing for long haul truck drivers who follow European Driving regulations.
- The analysis of feasibility and viability of the development of the final product was excluded.
- It was not a technology driven project, therefore evaluation of technologies in terms of which ones are more suitable to use in the final concept are not included.
- The development of software and detailed analysis of the materials that the final design could use were excluded.
- The resources available were mainly managed by Volvo Group Trucks Technology.
- There were milestones and deadlines to follow, hence the practical work was adapted according to those deadlines.

1.3 Authors

This master thesis was done as part of the program in Industrial Design Engineering at Luleå University of Technology, and the master program in Interaction Design

and Technologies at Chalmers University of Technology, where the authors worked in collaboration to achieve its purpose.

The part of the thesis that includes writing this report was fairly distributed in a way that both authors contributed in each chapter by dividing evenly the amount of work. Each author was responsible of a certain amount of sections and both proofread the document. Regarding the practical work of finding answers to the research questions, it was mainly done together, like preparing workshops, taking decision, collecting data from the users and critically analyzing how to proceed further.

Some tasks where the individual work was noticed are: Nadia participated in the field trip with a truck driver, Julia moderated all the interviews and the focus group that were in Swedish, Nadia coordinated having a survey in eight different languages while Julia was in charge of benchmarking to collect data. Nadia has more expertise in designing user interfaces while Julia has more expertise in product development. Nadia was in charge of making the prototype called "Share the day" while Julia made the one called "Adventure and exercise".

Both authors brought a variety of methods from their field of studies, for ideating and developing concepts which were combined to make the best use of them towards this research.

Julia Uttberg

I have a soon to be finished MSc degree in Industrial design engineering within product design. The projects and courses I have done previously have given me a broad experience within product development. I have used different development processes which have given me the experience of which one is appropriate for what purpose. A bank of methods is something that also built up through the education. It is beneficial to have tried many different methods to be able to choose the best one for each situation.

As an industrial design engineer I have a broad design focus that includes domains like product design, ergonomics, interaction design, user experience and also knowledge about how shapes and colors affect us. No matter what I end up designing, it is always good to have a broad knowledge within surrounding domains.

Nadia Cuotto

I am finishing the Master in Interaction designs and Technologies mainly focusing on user experience. Throughout the studies, I have learned and built a toolbox of methods and design models in which I based my projects on. During a design process I mostly focus on the phases of: user research, developing concepts, and test proof of concepts, and I usually involve users as much as possible, for collecting information, co-designing and evaluating solutions.

I have been part of technology driven and human centered design projects for the design of either user interfaces or tangible products. I also have experience in designing web and mobile applications following graphical user interface principles to offer thought through user experiences.

1.4 Stakeholders

One of the main stakeholders of this thesis work was Volvo Group Trucks Technology, represented by members of the Driver Interface & Communication department. Their main interest with this project was having a thoroughly research and analysis on long haul truck drivers' needs during their leisure time, and possible solutions to those needs. Therefore, their requirements and feedback were considered throughout the process.

Another main stakeholder of this research is the design team of this thesis, who has a high interest in developing a meaningful concept that could be implemented in the future, and that could add value to the truck drivers' experience when being in the cab.

Truck drivers are the target users to design for, focusing on those who drive long haul segments according to European Regulations. The target users influence the final design with input related with their needs and feedback when testing the concepts. Considering that the target users do not necessarily drive a Volvo Truck, other manufacturing companies or long haul truck models could also influence the final design.

Truck drivers' lifestyle and work affects their surroundings, some examples of that are: people driving on the same roads that they do, people living near or working at truck stops, truck drivers' families, truck driving job market and their work even has an impact on the infrastructure of roads per country (construction, regulations, and so on). This project will only focus on how the target users get affected by the surroundings and will exclude how the surroundings get affected by the target users.

At last, a secondary group of stakeholders are the universities where the designers of this master thesis took part of. Luleå University of Technology and Chalmers University of Technology have requirements and standards to follow, regarding the quality of the methodology and the content of the documentation. This is of interest for the design team in order to complete their educations.

1.5 Ethical Issues

One ethical issue that could have arised during this project and that should be considered when designing for in-vehicle systems is safety and distraction when users are driving. This project aims to design for when truck drivers are not driving, but if they are able to use the design when they are driving, how would it influence their driving performance and road safety?, and if those get affected, how can it be avoided to happen?

Truck drivers are usually alone (away from their family) when they are engaged in long haul truck segment. Their psychological and social state could be sensitive to

radical changes, therefore, the final design should be tested properly, avoiding any harm or negative effect on truck driver's mental health and social skills. Moreover, making an entertainment product could result in truck drivers spending too much time interacting with the product. This could lead to laziness, lower their working performance, affect their sleeping habits or even create addiction; which is also something to keep in mind when designing for them.

Other ethical challenge that the final design could bring is that trucks are work tools and the truck cab is a work environment, however it is also a home for truck drivers. Designing a product for truck drivers' leisure time might not be the most appreciated by haulage firms, especially if there is an increase on the price of the truck. The different interests within main stakeholders, customers and target users should be considered to create a product that fulfills them equally and that adds value to the truck driving lifestyle.

In addition, the final design could influence truck driving job market, encouraging more people to engage in this lifestyle and perhaps changing the mental model and stereotypes that people in general have about truck drivers.

1.6 Thesis outline

This thesis work is divided into eight chapters. Chapter one introduces the research problem and its objectives. Chapter two consists of the contextual framework of the problem, describing the current situation of long haul truck drivers and truck driving work. Chapter three provides with the necessary theory in which the thesis results are based on. Chapter four presents theory on the design methods chosen to follow in this research. Chapter five describes the process applied to accomplish the research goals. Chapter six presents the different results that bring solutions to the research problem. Chapter seven presents discussions about relevant subjects within the project, how the objectives were met, reflections and some recommendations if continuing further. Finally, Chapter eight presents the conclusions drawn from results.

2

Contextual framework

Volvo Group Trucks Technology is one of the largest manufacturing truck companies in the world (AB VOLVO, 2016). They are committed to offer to their customers: safety, quality and care for the environment through their products (AB VOLVO, 2012). Among the different departments within this company, the Cab development team aims to satisfy users and customers' needs with smart and innovative solutions (S. Eriksson, 2011). Several of the features displayed currently in Volvo's truck cabs have been either introduced or adapted based on customer's feedback (S. Eriksson, 2011).

Rikard Orell, design director at the cab development department, said in an interview that:

...the way we meet our customers' needs should be clearly reflected inside the cab. After all, it is a human being who will be living and working in the cab for several weeks at a time, so we have to do all we can to ensure that he or she will be happy in this small area. A solid, reliable, pleasant and relaxing work-tool – that's the aim of the cab's design
(S. Eriksson, 2011).

His statement refers to how important it is to offer a suitable living space to long haul truck drivers and shows that the Cab development team is aware of the limited available space inside the cab. They are also familiar with long haul truck drivers' work demands and aware that there should be a balance between working hours and leisure time, to make truck drivers feel like home in the cab (AB VOLVO, n.d.).

Current Volvo Trucks' models offer amenities related with truck drivers safety and comfort inside the cab (Volvo Truck Corporation, 2014), considering both their working and living conditions. In relation with entertainment options, Volvo Trucks offer audio systems and 19" TV as extra features (Volvo Truck Corporation, 2014, Volvo Truck Corporation, 2013), which imply an extra cost on the truck price. But besides them, there are not many other entertainment features offered in the truck cabs that truck drivers can interact with during their free time. Therefore, the Cab development team wants to explore and further develop entertainment options for them. They have noticed that besides safety and comfort, leisure activities are of great importance to research on.

2.1 Long haul truck drivers

Long haul trucking, also known as Over The Road driving, refers to the occupation of transporting any kind of freight over long distances, farther than at least 200km from truck driver's home (Complete School of Truck Transportation, 2014). It implies the use of a truck with a sleeper unit in the truck cab (Complete School of Truck Transportation, 2014), where drivers can rest and sleep during the nights they stay on the road.

2.1.1 Life and work

Long haul truck drivers differ from other types of truck drivers due to their work demands, of being away from home for several days, weeks and sometimes months. For most of them, truck driving is a lifestyle rather than just a job (Smart-Trucking.Com, n.d.).

Long haul truck drivers can spend a great amount of their leisure time inside the cab, as they have a limited allowance on the hours that they can drive (European Union, 2006). This means that the remaining hours of their days, they either load on/off or spend their time parked on the road.

Truck drivers tend to be alone as part of the work and some of them have a limited access to Internet or to make phone calls due to the cost implied when driving through several countries. Their lives on the road can sometimes imply taking showers and meals at truck stops (Complete School of Truck Transportation, 2014) or low access to sanitary facilities and drive for several hours (Broughton et al., 2015). In addition, finding a place to park to feel safe overnight (R & J Trucker Blog, 2016) and having a low wage adds stress to their lives (Broughton et al., 2015).

Some of the work challenges that they face every day can include traffic jams, driving on bad roads and very tight delivery schedules (Knestaut, 1997). Truck driving entails a lot of stress due to work conditions, resulting in truck drivers often suffering of fatigue (Broughton et al., 2015). As mentioned by Knestaut (1997): *"...driving can be an exhausting activity, especially in heavy traffic or bad weather"* (p. 56), and sometimes it can end in a tragedy on the road (R & J Trucker Blog, 2016).

All of these working and living conditions have negative effects on drivers' health and in their lives. Some truck drivers suffer of inadequate rest or sleep, bad eating habits (Broughton et al., 2015), spine injuries due to their sedentary life and heavy load lifting, exposure to diesel exhaust fumes (Steenland, Deddens, & Stayner, 1998). Overall, they are often exposed to physical and psychological risks (Broughton et al., 2015).

However not everything is bad about being a long haul truck driver. Among the benefits that they count with are that they can: set their own schedule (e.g. take a nap

any time during the day), be somehow independent and experience different landscapes that they might not have the chance to see otherwise (Smart-Trucking.Com, n.d.).

2.1.2 Work Conditions

There are different types of contracts that can be perceived among the long haul truck driving industry. According to Broughton et al. (2015), truck drivers can offer their service by being: employees (of a haulage firm), self-employed without employees (own the truck they drive) and self-employed with employees (own a haulage firm).

In order to improve long haul truck driver's working and social conditions, and to ensure road safety, the European Union regulated their allowance on driving and resting hours by periods of time (European Union, 2006). This regulation forbids to drive for more than nine hours per day and up to ten hours for only two days per week. During a regular day, every five hours and fifteen minutes there must be a forty five minutes break, distributed according to driver's preferences (either two breaks of fifteen minutes and thirty minutes or one uninterrupted break). There should also be two uninterrupted resting period of three and nine hours per day (European Union, 2006), to accomplish a total of 12 hours of resting time per day. During a week period, drivers should not exceed 56 hours of driving and neither 90 hours in two consecutive weeks. Moreover, every one and a half week they must take a logger resting period of 72 hours, where they can dispose freely of their time (European Union, 2006).

2.1.3 Use of Technology

In the last decades it has been recognized by the freight transportation industry the importance of having computer systems and information technology in trucks (Roy, 2001). Technologies such as GPS, handheld devices and Internet (to name a few) could: ease driver's work with the efficient and safe control of the vehicle, and optimize the execution of the freight plan for the customers, hauliers and drivers (Roy, 2001, Christensen, Glaeser, Shelton, Moore, & Aarts, 2010).

Some of the uses that drivers give to in-vehicle computer systems are for entertaining themselves, navigating, socializing and to stay safe in the car (Gkouskos, 2016). In addition, long haul truck drivers have high interest of having Internet service embedded in the cab to be able to use it mainly for work purposes and also for private use (Johansson, 2011).

Even though it is known how beneficial it is to have IT-based systems in vehicles, the implementation of new interactive technology in the automotive industry is slow, lasting several years to make changes to happen (Gkouskos, 2016). One of the main

reason is due to the high implementation costs, which motor carriers are not willing to experience, unless they are certain that it will be profitable (Christensen et al., 2010). Therefore, truck drivers tend to bring their own technology to keep themselves entertained or connected with their family or work. Some of the technologies that can be perceived that truck drivers bring to the cab are: mobile phones, Xbox, laptop, DVD, tablet, kindles and their own TV (Radley, 2015).

2.2 Long haul truck cabs

There are different types of commercial trucks according to their use. The one used for long distance transportation is called a long haul truck. It is used to transport heavy load for a long way which implies that drivers stay overnight in the cab due to being far from their homes.

2.2.1 Interior

Different truck companies try to make truck cab as comfortable as possible for the drivers by offering facilities in the cab, among the most popular ones are: cabinets, beds, climate system and cup holders (DAF, 2013, Volvo Truck Corporation, 2013, MAN Truck & Bus – A member of the MAN Group, n.d.).

Other facilities that can be perceived inside a truck cab are: refrigerator, ice box, water tank and microwave (DAF, 2013, Volvo Truck Corporation, 2013, Scania, 2015, Scania, n.d., AB Volvo, n.d.-b). Furthermore, in relation with entertainment facilities, some truck cabs offer: TV, information display, writing pad and stereo system with features like USB, AUX, Bluetooth, CD and radio (Volvo Truck Corporation, 2013, Nordström, 2013, MAN Truck & Bus – A member of the MAN Group, n.d.).

2.2.2 Dimensions

Heavy goods vehicles within Europe have restrictions about the dimensions and weight they are allowed to have, to avoid damaging roads and ensure road safety (European Union, 2016). The maximum length of a road train (a motor vehicle with a trailer or a semi-trailer attached) is 18.75 meters (European Union, 1996). There are exceptions of the directive which allow road trains to be longer in some countries, being the maximum 25.25 meters (International Transport Forum, 2015). The allowed length of the road trains is measured from the front of the motor vehicle until the back of the trailer (coupling hook or fifth wheel) (European Union, 1996), Figure 2.1.

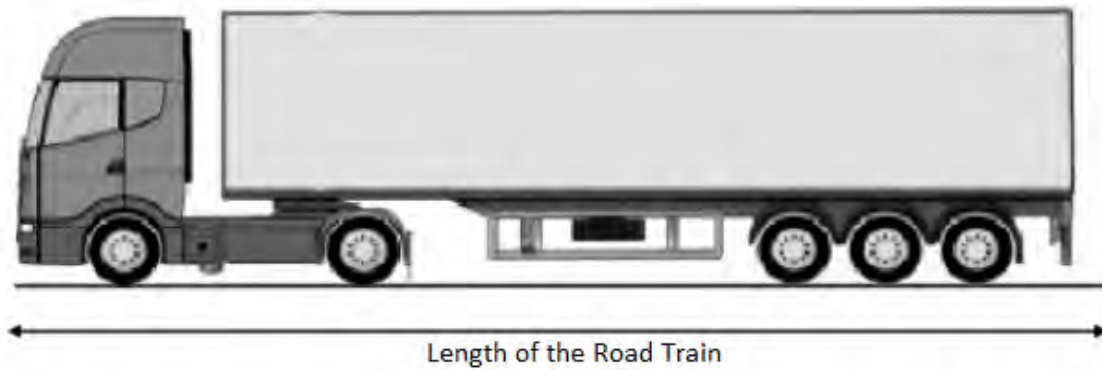


Figure 2.1: This is how the truck length of a road train is measured in Europe.
 Retrieved May 24, 2016 from: http://www.thelancetcodehealth.com/wp-content/uploads/2011/05/lorry_length21.png

In order to have an efficient transportation of the cargo, the trailer where the load is placed is preferred to be as big as possible. Therefore, the truck cab is often made as small as possible to invest most of the allowed length to the cargo. Cab sizes among different truck brands do not differ very much, the external width can vary from 2.3 meters to 2.5 meters (Mercedes-Benz Sverige AB, n.d.-a, Mercedes-Benz Sverige AB, n.d.-b) and the external length can vary from 2.225 meters (AB Volvo, n.d.-a) to 2.3 meters (Mercedes-Benz Sverige AB, n.d.-b). This gives them a working and living area of less than $6m^2$ where two seats (passenger and driver), one bed and the dashboard are also displayed, Figure 2.2.

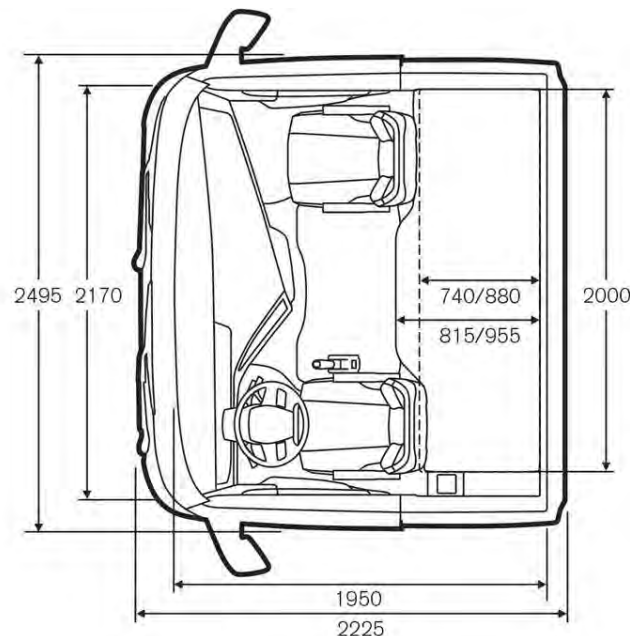


Figure 2.2: Volvo Trucks' FHserie - Long haul cab dimensions viewed from the top (measurements in mm),

Retrieved may 22, 2016 from: <http://www.volvotrucks.se/sv-se/trucks/volvo-fh-series/specifications/cab.html>

3

Theoretical framework

In this chapter the theory in which this thesis is based on is presented. It starts with an introduction of design domains and design considerations and then heads towards other information needed to support the thesis.

3.1 Design Domains

The verb “design” has been used since 1548 and has changed focus throughout time (Friedman, 2000). It has gone from having a humanistic perspective to an external perspective where form and function were in focus, and then back to the humanistic perspective where it is currently (Buchanan, 2001). Design theory from the early and middle twentieth century was focused on the external perspective, affecting the general picture of the design foundation (Buchanan, 2001), which can still be perceived in today’s practices. This gives a chance to understand what makes a product useful, usable, and desirable (Buchanan, 2001).

According to Cooper, Cronin, and Reimann (2014), industrial designers has traditionally focus on designing the static form of a product, while interaction designers focus on the behavior and how it changes over time. Even though Industrial Design discipline has given more relevance to form, the participation of this field in creating interactive products in the last couple of years has increased noticeably (Cooper et al., 2014). The visible growth of Information Technology (IT) demands different fields to unify efforts in order to create smart solutions. It is thought that the diverse backgrounds of the design team is very advantageous and will be reflected on the process and outcome of this project (Sharp, Preece, & Rogers, 2007).

S. L. Brown and Eisenhardt (1995) agree by stating that a qualified and well-coordinated cross functional group is one of the three factors to create a successful product. Cooper et al. (2014) strengthen this by saying it is beneficial that these two disciplines (industrial design and interaction design) join forces when the outcome will have a physical form, and even a necessity if it ends up being a handheld device. At last, they bring the design principle of: *“...form and behavior must be designed in concert with each others.”* (Cooper et al., 2014, p. 140).

3.1.1 Industrial design engineering

Industrial design engineering is an expression used in everyday language that refers to the mixture between industrial design and engineering (Smets & Overbeeke, 1994). Industrial design engineers should have knowledge within engineering courses (such as mathematics) as well as understand the affordance of products in terms of what they can do and what users understand the products do (Smets & Overbeeke, 1994). Cross (2000) states that the integration of those two skills are needed to have a successful design. He also states that a good process of design is converging towards industrial design engineers.

3.1.2 Interaction design

Interaction design is a relatively new discipline, which have transformed how products are appreciated and what is relevant for the users (Cooper et al., 2014). Cooper et al. (2014) defines interaction design as “...*the practice of designing interactive digital products, environments, systems and services.*” (p. xxvii). They also mention that interaction design applies theories and techniques from disciplines like: design, usability and engineering; in conjunction with its own methods, to understand and know what users really want. Further more, Cooper et al. (2014) state that interaction design is the only discipline that focuses on the design of behavior of complex interactive systems, and how that behavior relates to the form and content of a product.

Sharp et al. (2007) defines interaction design in a similar way, which is: “*designing interactive products to support the way people communicate and interact in their everyday and working lives*” (p. 8). This definition is more focused towards people and their relation with technology. Interaction design aims to understand people’s limitations, abilities and how they use and get affected by technology, in order to satisfy user needs with quality and effective user experience (Sharp et al., 2007).

Among other things that interaction design process encloses are: understanding emotions, temporal and spatial behavior in user experience, aesthetics, desirability of a product and cognitive principles (Cooper et al., 2014, Sharp et al., 2007).

3.2 Design Considerations

Cellario (2001) presents the importance of the design role when creating in-vehicles interfaces. He recommends to consider human factors and empathize with human sensibility early in the design process. According to Normark (2015) the automotive industry sometimes ignore user’s needs when implementing the latest technology in-vehicles, and when they are considered, often the car’s usability or other contexts of use are not looked into.

3.2.1 Design of in-vehicles systems

Engstroem et al. (2004) recommend when designing in-vehicles technologies, to be based on user needs and their expectations rather than only on technology. They also recommend involving the end users in each step of the development process, which in their view should be iterative and include design, prototyping and evaluation. In addition, if users are able to customize the in-vehicle interfaces, choosing what they think is best for them can result in better user experience, better use of the systems, more user satisfaction, and hence safer traffic (Normark, 2015).

There is a major concern on how in-vehicles interfaces work in traffic (Normark, 2015). Cellario (2001) states that driving is a very dangerous activity (both physical and cognitive), and even though in-vehicles technologies could offer comfort or improve drivers capabilities, they could also limit drivers abilities and hence could aggravate traffic situations.

Cellario (2001) states that not only safety (e.g. overload of information) is important, when designing in-vehicles interfaces, but also: usability, information visualization and driver's acceptance, which is related on how intelligent vehicles are perceived by the drivers. Some 'information display' issues that could influence safety, usability and user's acceptance according to Cellario (2001) are: modality (e.g. visual or tactile), format (e.g. text or voice), location (e.g. concentration or distribution) and time e.g. (duration or frequency).

Engstroem et al. (2004) recommends to have embedded in-vehicles system due to that: it is cost effective to implement several functionalities in one system, it could improve individual performance and allows adding new services to the system. They also mention the drawbacks of having individual in-vehicles systems: limited space, confusion to recognize systems and hence can result in information overload.

3.2.2 Design Space

Benyon (2014) presents the importance of considering the physical environment when designing interactive products and good user experience (UX). He mentions that interaction design will be perceived more in different places due to the growth of "Internet of Things", where technology is being used to augment physical spaces. In addition, he recommends designers, when exploring a certain place, to look into: its physical characteristics, the activities users can perform and what they actually do and people's feelings and social interaction when being in such a place; considering that every person can have different experiences in that place, and that their experiences can be influenced by the time of the day.

To reinforce this, E. Eriksson (2011) states there is a need of understanding how the physical space influences user experience and behavior, to be able to understand user's interaction and the use of a certain product. She recommends to consider

the context throughout the design process as it can trigger new ideas or help to improve existing products and also, can avoid new products to become superficial or not connected with reality.

E. Eriksson (2011) presents the “Four Space Model”, which is an analytical tool that can be used for either: gather information (like a guide to know what aspects to observe) or to frame or analyze a design idea. She mentions that the four design spaces are equally important to understand, when designing interactive products, and they are:

1. Interaction space: encompasses the physical human abilities, their limitations and the existing technology.
2. Social space: is where people interact with others and it includes technology but mainly focus on the social interaction aspect. This space can have a great impact on people’s lives and in the way they communicate.
3. Physical Space: is limited by physical constraints of the environment, including people, objects and interactive products displayed. She mentions that it is important to consider spatial and physical aspects when designing spatial interfaces.
4. Digital Space: is where communication happen either between technologies or between technology and users. This space is where the computer models, infrastructure and details on how feedback should be presented to the users.

In addition, it is of great importance to this thesis to understand how the physical layout of the context affects the user experience, behavior and their social relations.

3.2.3 Work from home

Long haul truck drivers live in their workplace place, or so, they work where they live for several days; being the truck like their second home. This situation resembles to the context of working-at-home, where the benefits and drawbacks of having these two environments physically apart (home and work) have been a topic of studies. Salomon and Salomon (1984) state that individuals behave differently according to where they are (either at work or at home), and they can show different aspects of their personalities in each context. Having these two environments apart can also be beneficial to enhance social interactions with their families and colleagues (Salomon & Salomon, 1984).

According to Shamir and Salomon (1985) and Gkouskos (2016), the time it takes to go from home to work and vice-versa serves as a preparation trance for individuals to adapt from playing a certain role to play another one (e.g. from business executive to family guy). They mentioned that the time and space dedicated for commuting provides the opportunity to cool off, distancing from stress and reflect in general. Long haul truck drivers work where they live, hence do not count with this transition

time that might help them to relax and prepare to get into the mindset that they are not working anymore.

3.3 Entertainment

Entertainment has become an irrevocably part of the biological life cycle as labor and sleep are (Arendt, 1961). Shusterman (2003) defines the word entertainment in three ways, which are as: *"...the action of occupying a person's attention agreeably", "that which affords interest or amusement", "a public performance or exhibition intended to interest or amuse"...* (p. 293).

Shusterman (2003) also states that a good way to keep yourself busy (but not necessary) is to do something pleasurable or interesting. It can be almost anything, which Zillmann and Vorderer (2000) confirm by assigning feelings related with entertainment, such as: happiness, sadness, terror, victory, calmness, etc. Entertainment can be a lot of things and feelings and it is neither clear nor obvious what is included and what is not. Although, Sayre and King (2010) claims that some of the things that are not entertainment are: art, ordinary life, complicated, moral (it is not said that is either good or bad for people) and it is not the truth, since it will use anything to stimulate and provide a better experience.

Boredom is a negative state that appears when a person lacks of interest on the ongoing activity (Fisherl, 1993). Hill and Perkins (1985) strengthen that statement by saying boredom occurs by subjectively monotonous experiences. Boredom during leisure is usually called "leisure boredom", experiencing it is a central effect of abundance of time according to Phillips (1993), as cited in Chen and Leung (2015).

The motivation of watching movies and TV, read books or listen to music is closely related with achievements than to relaxation or idleness (Vorderer, Klimmt, & Ritterfeld, 2004). They also say that people who often use these kinds of entertainment options seek effortless entertainment. Other users rather strive to get achievement and to challenge themselves (Vorderer et al., 2004).

3.4 Mobile applications for tablets

Banga and Weinhold (2014) mention that tablets are growing as individualized entertainment devices, which are perfect as entertainment options outside of the living room. Banga and Weinhold (2014) also state that tablets are the size of a book and that designing for tablets is similar to creating posters or book covers, which means that they have a very convenient size and this in conjunction with the digital applications that they can have, is the most exciting feature of them.

3.4.1 Designing User Interfaces

Applications of mobiles have gone from being mainly technical devices from its start to being focused on being usable, useful, and providing a good user experience too (Kjeldskov, 2013). Banga and Weinhold (2014) state that it does not matter how brilliant your concept is, unless the users experience is engaging and coherent as well as the product is easy to use, otherwise it will not go far. Banga and Weinhold (2014) also say that the cost of mobile applications usually is very low, if not free and since people do not spend much money on mobile applications, the incentive of investing time to learn the tool is low. This and also considering that people have very busy lives, the risk that applications get unused is high (Banga & Weinhold, 2014). They also recommend to constantly update the application's interface and let it grow along with the user's growth, this way it will be a constant evolution.

Banga and Weinhold (2014) present great importance to the simplicity of the design. They state that simplicity creates usability and that it almost always makes the design more successful. Designing towards simplicity is much harder than it seems, on the other hand, designing a coherent, influential and workable design is highly unappreciated (Banga & Weinhold, 2014).

Cooper et al. (2014) recommend that a design should consider the user expertise and should focus on the intermediate users. They mention that most of the people using a product (not for the first time), are neither beginners nor experts, they are somewhere in between; intermediates. As users do not like being beginners, they either become intermediates very fast or quit (Cooper et al., 2014). Therefore, Cooper et al. (2014) recommend to work towards three design goals: to move the beginners fast and painless into intermediacy, avoid obstacles that complicate intermediates way of becoming experts and lastly to keep the perpetual intermediates happy. They also recommend to accommodate beginners and experts without disfavor the intermediacy, and a way to make users learn better is to make them understand the cause and effect of the actions they do (Cooper et al., 2014).

3.4.2 Flat design

Flat design is a design style that lacks three-dimensional visual effects (Meyer, 2015), such as having flat buttons instead of protruding buttons. Three-dimensional effects provides an illusion of depth in the interface which facilitates the user's interpretation of the visual hierarchy and what parts are interactive (Meyer, 2015). Some examples on how to show affordance of features with three-dimensional effects that Meyer provides are: riced buttons and sunken input fields (created by shadows, gradients and highlights). Pseudo-three-dimensional effects also have its flaws, when the effects become too much and bring visual distraction, like they did in early interfaces, such as Windows 95 (Meyer, 2015). Banga and Weinhold (2014) state that people now are used to mobile applications and many of them are changing towards flat design. Banga and Weinhold (2014) mention that this could be due to

skeuomorphic design is no longer needed, and that perhaps acted as a scaffolding tool towards flat design.

Flat design became popular around 2012 and is still commonly used today despite its usability problems (Meyer, 2015). Meyer states that the main objection of flat design is that the usability tends to get sacrificed due to trendy aesthetics. One example of this is that the user's efficiency has been reduced since the user does not understand what is clickable and what is not (Meyer, 2015).

3.4.3 Navigation

Android Developers (n.d.-a) present the importance of having a consistent navigation (within the application) to the user experience, which can result in users' unhappiness if the navigation is not intuitive and does not behave as they expect. Android Developers (n.d.-a) recommend to follow guidelines to make the navigation predictable and hence reliable. Cooper et al. (2014) recommend that the most important and frequently used functions and controls should be placed in the most used and obvious locations, to facilitate the user's navigation. Cooper et al. (2014) also state that less used functions should be moved deeper into the interface to avoid that the users stumble over them. To point out the importance of this, they present the following design principle: *"Inflect the interface for typical navigation."* (Cooper et al., 2014, p. 240).

Android Developers (n.d.-b) mention that multi-pane layouts have a better visualization in landscape view since they bring a better visual balance, utility and legibility. The panes are often oriented from left to right and have an increasingly amount of details the more to the right they are placed (Android Developers, n.d.-b). According to Cooper et al. (2014) the size of objects convey the importance of things within an application. The larger images or texts are, the more attention they draw and therefore the more important the users experience them. Cooper et al. (2014) also recommend to use as few words as possible in texts that need to be read. To give the user an structured and organized experience of the interface, all the elements belonging to the same group should be aligned both horizontally and vertically (Cooper et al., 2014).

4

Methodology

This chapter presents the theory of the design approach and the methods chosen to address the research questions. The procedure on how to apply each method is described as well as when it is recommended to use them and the purpose to apply them.

The design process started by creating an overall plan that reflected on how the research questions will be answered efficiently within the time available, which is what is known as "research design" (Wadsworth, 2011). The design team defined their intended results by discussing how they visualize them to be and what form the results will have considering stakeholders interests. It was also defined the project scope, and thoughts were put into how to approach users, how to collect data, resources available and limitations implied.

The project was divided into three main phases to cover the project goals. The phases that were identified as important to create a quality product as recommended by Atman, Chinika, Bursic, and Nachtmann (1999) were: user research for gathering information and identify needs; developing concepts for evaluating alternatives; and final design for prototyping, evaluating and refining a final concept, Figure 4.1.

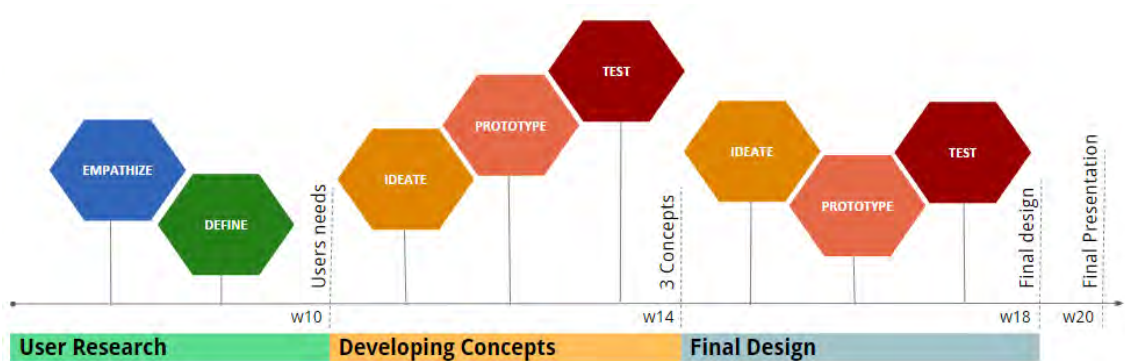


Figure 4.1: Design Process - Timeline

Moreover, each phase culminates with the delivery of a result. The results per phase will have the form of: user needs, three concepts that solve a chosen design challenge and the final concept that answers the research question. After analyzing how to undertake this project and defining the results, a more detailed project plan was created to organize ideas and manage activities on a weekly basis.

4.1 Design Approach

This project was initiated to design for long haul truck drivers' leisure time (when they are not driving), followed by defining: research questions, target users and context of use. As recommended by Wadsworth (2011), after deciding the context and users to focus on, the design approach to solve the research questions should be defined.

The design team decided that the project would follow a Human Centered Design (HCD) approach, in order to connect better with the target users (IDEO, 2011) and to deeply understand and empathize with their needs (IDEO, 2015, Giacomini, 2014). This was decided early in the process, to be able to know truck drivers' limitations and challenges while living on the road and their needs related with their free time.

LUMA Institute (2012) states that HCD practice involves critical thinking and reflective analysis to understand users needs by: identifying patterns and dimension of needs, establishing priorities and transforming data into actionable insights. Applying HCD methods imply learning directly from the target users, as the key information to solve their needs lies on them (IDEO, 2015, Giacomini, 2014). They are the ones who experience challenges, who have interests and desires to live and work in a better place, and their lives are the ones that will be mostly affected with new designs. Therefore, the target users should have an active role throughout the process, this in order to understand them, design and refine solutions by keeping them as the base of evaluation (Giacomini, 2014).

In addition, as there are many stakeholders involved in this thesis, it is within HCD objectives that the design decisions are based on the user needs and also on the other stakeholders' interests (IDEO, 2015). Another reason why HCD approach was also chosen was due to the form or technology that the final solution would have was unknown and not defined early on, which is how IDEO (2015) states a HCD project should start, from not knowing how the solution would be and by improving solutions based on the user's until their needs are fulfilled.

At last, the design process was decided to take a Design thinking model introduced by Plattner (2010). This was due to it will not follow a step by step or milestone process but rather is divided into spaces where the design team can fluctuate from the five different spaces to achieve certain goals. The spaces that this model presents are: Empathize, Define, Ideate, Prototype and Test (Plattner, 2010). Design thinking was chosen because it is a human centered design approach towards innovation

(IDEO, 2016). Furthermore, as this project has a limited duration, the Design thinking model was adapted to the three phases the project was previously divided into, Figure 4.1.

4.2 Empathize

The mainstay of designing for the right needs is to gather data directly from the target users (Beyer & Holtzblatt, 1999). Ackoff (1974) states that *"We fail more often because we solve the wrong problem than because we get the wrong solution to the right problem."* (p. 8). A great amount of time was therefore invested to approach and collect data from the users, to ensure understanding them and be able to define the right needs, Figure 4.1.

Empathize is the process of observing and interacting with users followed by immersing yourself to experience what they experience, which is the core of HCD process (Plattner, 2010). Empathizing is the best way to truly understand the design space and the complexity of users lives, and also to motivate every design decision based on the users and their needs (IDEO, 2015). According to Plattner (2010), designers need to build empathy with the users to know what is important for the users and should observe the user's behavior when they are in the right environment to perceive what they feel and how they think. Plattner (2010) also mention that the best innovative solution comes from addressing insights related with human behaviors, which can be unfolded from a successful empathize process.

4.2.1 Interview

Interviews are beneficial to get insights and understanding of inter-alias: the problem, users and the context, through the user's perspective (van Boeijen, Daalhuizen, Zijlstra, & van der Schoor, 2014). They mentioned that interviews can be used for different purposes and in different phases of the development process, such as: to collect contextual information in a preliminary phase and to gather feedback to refine a developed concept.

According to van Boeijen et al. (2014), interviews are most likely to be successful when the products to be developed are somehow familiar to the users. They also state that interviews give deeper insights than for instance, a focus group, since the interviewee have the chance to go deeper into each answer, which might not be possible when managing a large group of people. At last, van Boeijen et al. (2014) state that around 80% of the user's needs will be revealed within 10 to 15 interviews.

There are different type of interviews, some of them known as: unstructured, semi-structured and structured interviews. Sharp et al. (2007) mention that these are classified according to the level of control interviewers have on the conversation through prepared questions. Sharp et al. (2007) present structured interviews like

the ones that are more controlled due to having closed questions (where the range of answers is known) and unstructured interviews like the ones that are the least controlled due to having open questions (where there is no expectation on format or content). Semi-structured interviews are somewhere in between the other two types, with both open and closed questions (Sharp et al., 2007). With semi-structured interviews, interviewers can gain knowledge of familiar domain and also within new ones through the follow up questions, which can be asked after each prepared question (Sharp et al., 2007).

Some recommendations to keep in mind when holding an interview are: to give the participant enough time to tell his or her story, it is important that the interviewer do not speed the interview without letting the participants to finish (Sharp et al., 2007), and that interviews should take place in a relaxed environment without any distraction, recommended by van Boeijen et al. (2014), IDEO (2015) and LUMA Institute (2012).

4.2.2 Scenario

Scenarios are stories or detailed descriptions of a possible concept, they present a number of actions that leads to an outcome (Rosson & Carroll, 2009). Scenario-based design consists on a description of a system in its early development stage, and it can include how the user should use the system to complete a task (Rosson & Carroll, 2002). They also mention that scenarios can be done with different levels of details, often being roughly described. According to Rosson and Carroll (2002), scenarios can be used for many purposes such as: to look for user needs, find underlying issues and to test prototypes.

4.2.3 Contextual inquiry

According to Beyer and Holtzblatt (1999) a contextual inquiry is a field interview that takes place in the user's real environment (e.g workplace, living space). The interviewer observes the user in their familiar context while asking questions related with the actions the participant do. This is done in order to understand the motivation behind their actions (Holtzblatt & Beyer, 1993) and to help the users relate and remember their experiences. Sometimes users might not even be aware of certain needs when being interviewed (Holtzblatt & Beyer, 1993), however through this method details that are implicit for them can be revealed, for both the interviewer and the participants, due to they can get strengthen by the context where the interview takes place (Beyer & Holtzblatt, 1999).

4.2.4 Focus group

van Boeijen et al. (2014) describes this method as a meeting where several people (preferable target users) gathers to discuss about concerns or issues related with a certain product or service. van Boeijen et al. (2014) mention that some of the advantages that this method can bring is a quick overview of the users' opinions and unexpected insights that can result from the open discussion among the participants. Focus groups consist of introducing different topics to the participants (between six to eight people) and invite them to express their ideas and thoughts related with those topics (van Boeijen et al., 2014). This method can be used throughout the design process to gain contextual information on how users use a product, to evaluate alternatives and to get ideas to refine a concept (van Boeijen et al., 2014).

4.2.5 Word Association

This method is recommended to be used for understanding better the definition of a certain word according to people's interpretation and mental model of that word (Functional Product Development, 2010). Functional Product Development (2010) describes that this method is done by asking participants to write down words or phrases associated to a certain word presented to them, the association can also be said out loud to the group. The exercise ends with a mind map of all the associations (Functional Product Development, 2010).

4.2.6 Survey

Plattner (2007) defines surveys as a series of questions that are carefully structured to quickly collect many perspectives and test or quantify insights. Plattner (2007) also recommends to have an explanation in the introduction of the survey, to always include an open ended question and to test the survey before releasing it.

According to Nancarrow & Brace, 2000 (referred in Tullis & Albert, 2013), participants provide a more positive feedback when surveys are collected in person or through phone, rather than when the responses are anonymously, which can result in the 'social desirability bias' phenomenon. This means that people are trying to answer the questions as they think the interviewer wants them to, so they look better in the interviewer's eyes (Nancarrow & Brace, 2000 referred in Tullis & Albert, 2013). The recommendation Tullis and Albert (2013) give when applying face-to-face surveys is to collect the data in a way that the moderator cannot see the response until after the participants have gone away from them. They also mention that the main disadvantage when applying surveys is that the data collected per participant is somewhat limited, but because it can reach a large amount of participants this can be compensated (Tullis & Albert, 2013).

'Fill in the blanks' is a survey method that generates a high amount of qualitative data (Bauer & Kientz, 2013). According to Bauer and Kientz (2013), it consists of presenting a text of a scenario with empty gaps left out where the users should write a word or a phrase that they believe fits in the gap. They also state that the text should be written in a way that is easy to understand what kind of words are expected to be written.

4.3 Define

As stated by IDEO (2011); *"Deep understanding, not broad coverage, is the strength of qualitative research."* (p. 22). Therefore, different problem analysis methods should be applied in order to structure the data and to have a better comprehension of it, as the key to define users needs relies on how the data is interpreted (IDEO, 2011). Moreover, IDEO (2011) recommends to apply abstract thinking to analyze and transform the data into ideas and concrete solution, every time new data is collected.

According to Plattner (2010), the define space comes after gathering data from the users and consists of debriefing and synthesizing findings into user needs and insights, followed by defining an actionable design challenge to focus on. Plattner (2010) states that this design challenge should reflect your point of view from what was collected in the empathize process to be able to envision and create smart solutions. The define mode is of great importance in the design process, because the following steps will unfold and focus on the defined problem statement (Plattner, 2010), and this one should represent the right needs and also should be phrased thoughtfully.

4.3.1 Affinity Clustering

This method consists of identifying patterns among different ideas or data gathered from user research (LUMA Institute, 2012), to help understand certain problem or findings in general. This method can be applied by writing all the research findings or ideas on post-its, followed by clustering the post-its into logical groups that have certain similarity among the ideas (LUMA Institute, 2012). Each resulting group is then labeled with a word or a phrase that represents what those ideas have in common (LUMA Institute, 2012).

4.3.2 Frame the design challenge

This method consists of defining a problem statement in which the design solutions to that problem will be focused on. According to IDEO (2015), the design challenge should be written in the form of a short sentence or question and it is important

to make sure that it leads to an impactful solution, that you can get a variety of ideas and that it considers constraints and context. The design challenge should have a defined scope, which should neither be too broad nor too narrow, otherwise generating ideas will be limited or difficult to approach (IDEO, 2015). IDEO (2015) also state that an iteration of this method can be beneficial to get clearer picture of what to do, envision design solutions and if needed, change of focus depending on designers interests.

4.4 Ideate

Ideate is the space where the idea generation process takes place (Plattner, 2010), hence an open and broad mindset should be present to be able to get a great amount of diverse ideas (IDEO, 2015, Plattner, 2010). The main purpose of ideation is not only to get a lot of ideas but rather to get one great idea that will result on the best solution to the user needs (Strategyn, n.d.). According to Osborn (1963) a quantity of ideas will eventually lead to quality, therefore the more ideas and alternatives you have provides a higher chance of finding the ideas that you are looking for.

This space also includes the process of evaluating and identifying the best ideas that can lead to a promising solution, among all the ideas that were generated (IDEO, 2015). When applying ideation methods, Plattner (2010) recommends to keep in mind to: get rid of or avoid obvious solutions and let wild ideas flow, which can lead to innovative solutions; and explore different areas (unexpected ones) to get a variety of diverse ideas.

Moreover, Cross (2000) presents some recommendations when moderating workshops and applying creative methods such as Brainstorming. He mentions that it is beneficial to have a diverse group, where there should be people with expertise within the same area, and also people with different expertise in other areas. At last, he presents the importance of having a non-hierarchical atmosphere among the group, and not even the moderator of the workshop should have a higher level even though he or she is leading the workshop.

4.4.1 Concept Portrait

This method is used to analyze complex concepts and develop well-defined design requirements (Roberts, 2013 referred in Gkouskos, 2016). According to Gkouskos (2016), Concept Portrait helps design teams to have a shared understanding of those complex concepts, and he recommends to apply it early in the analysis phase of the design process. Gkouskos (2016) mentions that Concept Portrait consists of letting each participant do word associations by answering six questions about a concept. The questions have the following format: "if (the concept) was (an activity), what would it be?", and 'an activity' can be replaced by any other association such as:

animal, place, object, etc. (Gkouskos, 2016). Gkouskos (2016) recommends that the questions should be answered rapidly and afterwards each participant explains the motivation of their answers.

4.4.2 Insight Combination

Insight Combination is an ideation method where insights (from the contextual research) and trends (in the world) are combined to get hundreds of design ideas (Kolko, 2010). This method consists of writing down all the insights on yellow post-its and relevant trends on blue ones. The participants then takes one post-it of each kind and combine them into a new design idea on a green post-it (Kolko, 2012). Kolko (2010) states that the benefit of this method is that the designers get forced to use all the user research insights. Furthermore, Kolko (2012) recommends that there should be a time limit of one minute to write an idea, the reason for this is to come up with many ideas rather than trying to come up with only good ones.

4.4.3 Osborn's Checklist

The Osborn's checklist has the purpose to generate ideas based on an already existing idea, it consists of a list of questions on how that initial idea could change if certain conditions are applied (Vullings & Heleven, 2013). Some of the questions that Osborn (1963) propose to have in the checklist are:

- **Put to the uses?** Other ways if modified
- **Adapt?** What else is like this? what could I copy
- **Modify?** New twist? Change meaning, color, sound, shape?
- **Magnify?** What to add? More time? Stronger?
- **Minimize?** What to subtract? Smaller? Shorter?
- **Substitute?** Who else instead? other ingredient?
- **Rearrange?** Interchange components? Other pattern?
- **Reverse?** Transpose positive cause and effect?
- **Combine?** How about a blend? Combine purposes? Combine units?

By going through this list and answer each question with at least one idea, it is possible to generate several ideas in a short period of time (Osborn, 1963).

4.4.4 Reverse Brainstorming

This method consists of changing the wording of the problem statement from how to "solve it" into how to "cause it" when starting a brainstorm session (Vullings & Heleven, 2013) to get a different perspective on the problem (Wilson, 2011). After

Brainstorming ideas on achieving the opposite effect of the design challenge, you should convert the ideas back into positive solutions and after, choose which ones can be considered in your original problem (Wilson, 2011). This method can be easier than regular Brainstorming due to it can be easier to see the negative side rather than positive when generating ideas (Wilson, 2011), however it demands more time invested due to the need of converting the solutions into positive ones.

4.4.5 Power of Ten

It is a technique that consists of re-framing the problem to get more ideas or insights from previous ones (Plattner, 2010). This in order to change perspective and evaluate the context by either taking a step back and see an overview of the problem and its surroundings, or taking a step forward to see more details from the problem (T. Brown, 2013). T. Brown (2013) mentions that to apply this method for idea generation, a constraint is added on the solution space, he presents the following constraint examples: *"What if the solution had to cost less than five cents?"*, *"What if the solution had to be bigger than a house"?*. At last, T. Brown (2013) recommends to try to come up with ideas that address your design challenge and also fulfill the new constraints.

4.4.6 Brain-writing 6-3-5

The Brain-writing 6-3-5 method is a creative design method to apply in groups of six people (Markov, 2012) and can be used as a substitute of Brainstorming (van Boeijen et al., 2014). It consists of having each participant writing in a piece of paper three ideas in a five minutes period, followed by passing those ideas to the next participant until everyone have contributed in each others ideas (van Boeijen et al., 2014, Vullings & Heleven, 2013). By applying Brain-writing 6-3-5 successfully, you are prompt to have 108 ideas in 30 minutes after culminating the six rounds according to Markov (2012). In addition, this method is recommended to be used when starting the Ideate space, right after the design challenge has been defined (van Boeijen et al., 2014) and its main benefit is that unlike Brainstorming, it encourages an evenly participation among the team without being verbally led (Vullings & Heleven, 2013).

4.4.7 Alter ego

Alter ego is an ideation technique where the solutions generated are based on thinking how a fictional or known character would solve a problem or use a product (Innovation Styles, n.d). According to Bicks (2016), by applying this technique it is guaranteed that you will get unique and outside of the box ideas, and the quality of them will depend on the team's personality, expertise and vibe in the environment.

Alter ego consists of introducing known characters (e.g. Homer Simpson, Steve Jobs, etc.) to the participants of the ideation session, each participant then choose one of those characters (Bicks, 2016). The problem that needs to be solved or the goal of the ideation session is then introduced, and now each participant have around 30 minutes to come up with an idea by taking their character's shoes and imagining how they would approach the problem (Bicks, 2016). It culminates by discussing all the ideas and analyzing which of them can be used later on in the process. According to Innovation Styles (n.d), this technique can also be used to explore innovation styles by choosing one random fictional character or one that represents the opposite of your target users, this will help the participants to explore new design premises.

4.4.8 Dot Voting

This method is often used as an efficient way to reduce the amount of ideas and pressure the team to make a decision to be able to move forward (Functional Product Development, 2010). It is enhanced by group work thinking, where each member express their different points of view to make a collective decision on a design solution (MediaLAB Amsterdam, n.d. Functional Product Development, 2010). It consist of each member voting on their favorite ideas (two or three votes per member) with post sticky dots, rearranging those ideas from the ones that got most votes to the least votes and it ends with a discussion among the team about which of those ideas can be taken to the next step (MediaLAB Amsterdam, n.d., Functional Product Development, 2010). MediaLAB Amsterdam (n.d.) states that even though it could bring benefits to apply this method, as a counterpart there is the fact that the selection on the ideas is subjective, lacking of critical thinking.

4.4.9 Weighted Matrix

According to Hanington and Martin (2012), this is an idea evaluation method that helps on the decision-making of choosing the best solution among several concepts. They mention that it consists of defining key criteria to evaluate the concepts considering stakeholders interests in relation with what is best for their business. Vullings and Heleven (2013) recommends that each criteria should be given a ranking value (e.g from 1-10) to be able to measure in a structured manner the different concepts, evaluating each concept with a satisfaction value on the criteria (e.g from 1-10) should follow and after, multiplying those two factors. Weighted matrix is recommended to use for either reduce the number of ideas or when choosing one idea to develop further Hanington and Martin (2012). However, it is still a subjective evaluation even though the results are quantitative (Vullings & Heleven, 2013) and the priority is given to the business success rather than personal bias Hanington and Martin (2012).

4.4.10 Physical and Geographical Boundaries

This is an ideation method that works in a similar way as the Osborn's checklist where an already existing idea is used as a basis to develop it further and to make new ideas. According to Made by Makers (n.d), the method is about restraining the design space with physical and geographical boundaries when generating ideas, and these ideas should have the form of solutions only. They recommend that the boundaries should not be associated to the real context of use in order to get wild ideas rather than obvious solutions, giving the example of: *Find solutions that take place in a bathroom, garage or a playground.*

4.5 Prototype

According to Benyon (2010), a prototype is a tangible representation or implementation of parts of a design, to either convey early stages of a concept or to test details of it. He states that this representation should reflect the interactivity of the product; how it behaves or react when an action is performed. Furthermore, Benyon (2010) adds that the resources used for a prototype and its form vary depending on: its purpose, the target users and the stage of the design process. Therefore, they can be made out of different materials, from simple to more complicated ones, such as: paper, cardboard or even software tools (Benyon, 2010).

Prototypes are mainly used to evaluate functionalities of your design ideas by inviting people (e.g. the design team, the users, stakeholders and others) to experience or interact with them (Plattner, 2010, Benyon, 2010). However, according to Plattner (2010) they can also be used to get more empathy with the users, to explore and develop other alternatives of solutions, to refine and create solutions with the users and to inspire others with your vision of an idea.

A recommendation when prototyping is to make them simple at early stages, in order to test several ideas rapidly and to keep the focus on key elements (Plattner, 2010, IDEO, 2015). That said, Benyon (2010) presents two main types of prototypes: low fidelity and high fidelity. He mentions that low fidelity prototypes are usually paper made or a screen-shot of the idea, and they are often used to evaluate content, form and structure. Designers should neither invest too much time nor effort in making them and it should be easy to make them again several times.

Benyon (2010) also states that on the other hand, high fidelity prototypes look more alike or behave in a similar way as the final product. They are software based and are mainly used to evaluate usability of the design and details such as: look and feel, behavior, functionalities and content (Benyon, 2010). This last type of prototypes are time consuming to produce and can bring confusion among clients by thinking that the prototype is the real final product (Benyon, 2010).

4.5.1 Dark Horse Prototype

These are physical prototypes that are made to explore an idea or intuition that was discarded early on the process, hence they are an improvement of an existing prototype (Carleton & Cockayne, 2009). According to Carleton and Cockayne (2009), its name comes from the field of horse racing, where the term "dark horse" is used when referring to the horse that has the least chance of winning but at the same time may bring the greatest chance of rewards. Designers have brought this term into the design field, to allow practitioners to think outside of the box and explore those ideas that they rejected or lost during the ideation process, due to the ideas were too radical, unacceptable, not feasible, etc. (Carleton & Cockayne, 2009). Carleton, Cockayne, and Tahvanainen (2013) states that after deeply understanding the design problem, by prototyping those early rejected ideas you would be prompt to focus on what is truly important, to bring innovation to your team, and taking from them insights that could make your final design better (Zabel, 2015), which is what is known as "Dark Horse" in design. It is supposed to bring crazy ideas that are not expected to work to become into innovative solution (Zabel, 2015).

4.6 Test

Testing is the process of presenting your design ideas or solutions to others in order to get feedback and improve your prototypes based on that feedback (Ratcliffe, 2009), which is crucial for the design process (IDEO, 2011). The test space is very important and should demonstrate an experience or the behavior of a product (even if it is in its early stages) (Master, 2015), this will lead to iterate and refine the product to make them better. Testing will reveal to design team what works and what does not work for the users (Ratcliffe, 2009).

Plattner (2010) recommends to *"prototype as if you know you're right, but test as if you know you're wrong"* (p. 5), which means that testing can often lead you to take a step back in the process to be able to move forward. Tests can reveal unexpected findings, can help you build a better empathy with the users and can show that not only your solution is not the best one but also if you failed to frame the right problem (Plattner, 2010). Furthermore, methods used in the empathize space can be used for testing purposes, in which users and stakeholders are approach to confirm their needs and evaluate solutions.

Six and Macefield (2016) states that looking for errors of innovative user-interfaces can be done rapidly by testing a prototype with rather few participants. He mentions that the number of test participants varies depending on the purpose of the test and the complexity of the project. Six and Macefield (2016) recommends few participants when testing novel designs and more participants when testing more complex designs. For problem-discovery studies, between three and twenty participants are required and for comparative studies, between eight and twenty-five

participants are required (Six & Macefield, 2016). On the other hand Nielsen (2000) states that testing no more than with five users will lead to the best results. Nielsen (2000) recommends to prioritize the numbers of tests, and hence iterate in the process, than the number of participants; mentioning that the optimal ratio related with cost-benefit analysis of user testing is between 3 and 5 participants.

5

Process

In this chapter the different steps taken to answer the research questions of this thesis are presented. Each step is described according to the phase of the process where it belongs as well as the space from the design thinking model, Figure 4.1.

Wadsworth (2011) states: *"...a good research retains the capacity to respond flexibly as the inquiry unfolds."* (p. 57), hence the design team adapted their process according to where findings gotten throughout the process lead to.

5.1 User research

The user research was done during a ten week period to assure targeting the right needs through a variety of design methods. However, due to limitations on resources and on accessibility to a broader sample of participants, the core of this thesis is based on qualitative data. According to Cooper et al. (2014), collecting qualitative data can help to identify behavior, patterns and attitudes among users of a certain product and it also helps to understand the context and the vocabulary of the users.

This section presents the methods used to approach and understand users during the Empathize space, and the ones used to analyze that data and define their needs during the Define space. This phase culminates with the definition of the design challenge in which the following phases are based on.

5.1.1 Empathize

The first step to learn about the target users before making contact with them, was through literature review, searching on what has been designed for them, what problems have been targeted already and also to understand the need of leisure activities in people's lives. Most of the literature found on long haul truck drivers were related with health issues and safety, which is not completely within the scope of this thesis. Therefore, online research followed to see from the user's perspective, their experience and lifestyle. This method was applied throughout the entire user research phase, to confirm and complement findings.

Blogs and forums were looked into as well as joining their social network groups to observe what they talk about. From this, it was confirmed that users tend to have an unhealthy life when being a truck drivers, but it also revealed other challenges that this lifestyle brings, e.g. maintaining relationships, being away from home, working more than ten hours a day and high work demands (R & J Trucker Blog, 2016, Smart-Trucking.Com, n.d.). It was also noticed that some drivers gave value to decorate their trucks to try to have a home or belonging feeling.

All the information found was used as inspiration to approach truck drivers and to define what to focus on when gathering data from them. When defining how to approach users, it was discussed the possibility of observing or shadowing them, but due to the fact that the context (truck cab) has a very limited space to be in, it was considered intrusive to try to observe an unknown truck driver from inside of the truck cab. It was also thought that truck drivers would not act as they normally do if a stranger (member of the design team) was in the cab with them, and it is unethical to surveil what they do without their permission. Therefore, interviews looked like best option to approach them.

5.1.1.1 Pilot testing Interviews

Semi-structured interview questions were prepared to approach truck drivers in a truck stop, to understand the users behaviors and collect data from them. The design team decided to do a pilot test of the prepared questions in a nearby truck stop to explore and evaluate holding interviews in that context. The pilot test took place at Sandsjöbacka truck stop located in Kungsbacka (Sweden), and the aim was to improve the prepared questions and apply them later in a larger truck stop.

The reason why semi-structured interview was chosen was to have predefined open questions and depending on what it led to, the design team adapted the follow up questions. It was decided that the duration of each interview should not be longer than 20 minutes, to respect the drivers breaks.

The aim of this approach was to find out the main challenges of living in the cab and being away from home. More in detail, the design team wanted to know the reasons or motivations to start a truck driver lifestyle and compare these reasons depending on their culture, family situation and age. In addition, the design team aimed to learn the activities truck drivers do when they are not driving. The questions were then prepared accordingly to address these learning goals.

The design team approached truck drivers when they were inside their trucks since they could be relaxed by being in a familiar environment and hence, be beneficial for the interview. However, the design team were not able to get inside the cab, which created a barrier between the interviewers and interviewees. The open area of the truck stop parking lot brought some drawbacks to the interview environment, such as: noise, fuel smell, cars driving and others. Moreover, it was recommended to wear reflective jackets with Volvo Trucks' logo on it to represent the company.

This brought some confusion among truck drivers due to they mistook the design team with guards (of the parking lot) working for the truck stop.

The design team was able to get six interviews, which gave enough information to improve the questions and the approach to truck drivers. It was noticed that many of the truck drivers who passed by Sandsjöbacka truck stop only spoke their native language, which varied from Latvian, Polish, Romanian, Russian and other European languages that the design team did not speak. This resulted in many interviews that could not take place due to language skills limitations.

It was noticed from the findings of this six interviews that many of the drivers do not miss their homes, they miss the activities they do and the comfort that their homes provide. Most of the truck drivers stated that they liked their job but: space in the cab, shower and wifi facilities would be appreciated. It was also mentioned that they spend a lot of time waiting in the truck, which can be boring sometimes and that stress is present due to being always alert with other cars and finding a place to park.

5.1.1.2 Field trip with a truck driver

To gather more information and to empathize with the users, a trip with a truck driver was organized, to closely perceive how the driver behaved in his daily work life. It was considered that the driver would inhibit himself of acting as he normally do when he is alone, but the design team wanted to explore what situations could be a point of focus to design for or what scenarios could spark ideas.

The participant was a retired long haul truck driver who currently runs his own haulage firm and drives every now and then. The field trip lasted seven hours, in which five of them were for driving from Gothenburg to Halmstad (Sweden) and back. As the design team imagined that the participants actions during the break would not be natural, some contextual inquiry questions were prepared. These questions were thought to help the user to remember and relate his normal behavior when he is in the cab, and to understand what he does and why. The contextual inquiry questions were related with entertainment and activities during the drivers' leisure time. The learning goals were to: target challenges that might not be mentioned by him, perceive how he enjoys his free time with the resources available and target scenarios (throughout the day) to explore further, Appendix A.1.

There were also two unrealistic scenarios present in the interview questions, where the truck driver had to imagine being in certain situation and explain how he would behave in such a situation. The description of these scenarios were specific but left room for open interpretation, so the user had enough information to imagine and place himself in the context without leading him on what he should do.

This field trip revealed information that was not considered previously. The truck driver mentioned that an average day could imply working 15 hours (including driv-

ing, downloading and uploading freight), which left little room of free time to enjoy. This contradicted on the findings of drivers feeling like they have "too much time to spare" gotten from previous interviews.

The participant also mentioned that driving gives certain high tempo, therefore after finishing work, relaxation is needed to be able to enjoy doing other things. This confirms the importance of having a space to have the mindset transition from "being at work" to "being at home" presented by Shamir and Salomon (1985) and Gkouskos (2016). In addition, he stated *"You are at work 24/7"* (participant from the field trip, personal communication February 15, 2016), referring that it is very hard to disconnect completely from work, stress and other concerns, in comparison with when being at home where you can disconnect from everything at anytime.

5.1.1.3 Interviews at a truck stop

Semi-structured interviews were held using the improved questions tested previously at Sandsjöbacka truck stop and adding scenarios which were created based on the findings from the field trip with the truck driver (Appendix A.2). This session was held in a bigger truck stop named Björkäng outside of Varberg (Sweden). This truck stop offers more facilities to truck drivers than the previous one, where one of them is a restaurant.

The design team thought it could be beneficial to approach drivers when they were in the restaurant, as they might be more relaxed and also to get closer to the truck drivers without distraction from the environment. However, several of the drivers disliked to be disturbed while they were eating or sitting in the restaurant, hence the design team had to change approach to when drivers were in their trucks, even though they were aware about the barrier that such a setting created.

In total, nine truck drivers took part of the interviews, in which some patterns were noticed. Most of them expressed that they worked more than 12 hours/day and some of them also mentioned that it is very boring to be alone in the evenings. One participant said that it is always boring to sit somewhere in the evenings alone if you do not have anybody else there: *"Tråkigt, tråkigt, det är väl fan alltid tråkigt att sitta någonstans på kvällarna ensam om man inte har några andra där"* (participant from the interviews, personal communication February 17, 2016). Among the things that was perceived that participants value the most are: being able to relax and having social contact (either with people they know or strangers). This could be due to how the questions were phrased, because they had to choose within different options, however it was kept in mind for the following steps.

The interviews occurred by approaching random truck drivers and knocking on their truck's doors, hence the truck drivers were neither prepared nor willing to engage in the interviews for long period of time. The environment was not relaxing as they were in a truck stop with the many distractions that this setting brings. Therefore, it was decided to arrange a focus group to have a controlled environment in which

the participants could be prepared beforehand. The main advantages was that the participants could know what exactly was expected from them or with what information they could help with, and lastly, they can get into the mindset that the interview will last a certain amount of time.

Furthermore, it was noticed that at Sandsjöbacka truck stop there was a more spread span of nationalities in comparison with Björkäng truck stop, even though Björkäng offers more facilities. The design team decided that if other visits to a truck stop were due, Sandsjöbacka was a better option to go to.

5.1.1.4 Focus group with truck drivers

A Focus group was organized to get more qualitative information in a controlled setting and also to confirm and explore further previous findings. A plan was made by defining the learning goals and different design methods to apply during the session, Appendix A.3. In general, it was difficult to find long haul truck drivers available and interested in taking part of the focus group, therefore only two long haul truck drivers were able to attend.

The focus group was held in the participant's office (chosen by them) which was thought to make them comfortable by being in their familiar space. The session started with an icebreaker followed by the Word association method, in which the participants expressed their interpretation of the words: *Leisure* and *Entertainment*. Afterwards a discussion was held with predefined topics, including the presentation of two scenarios with the aim of understanding how the participants would react if being in those futuristic situations.

The discussion was rewarding even though it was a small group, however, the findings were only used as inspiration in the following phases due to it was the point of view of two truck drivers only. They both mentioned they did not like having breaks during work days and one of them expressed that the final 10 minutes of a break feels like the longest 10 minutes ever; where he usually plays with the phone to kill time. The participant explained it like you sit and look at the clock while hoping it will turn over; "*Man sitter och kollar på klockan, slå över slå över, kom igen nu*" (participant from the focus group, personal communication February 27, 2016). They both mentioned that it is hard for them to fall asleep when they are stressed and one of them indicated that he would appreciate having something that helps him relax.

5.1.1.5 Online survey

The survey method Fill in the blanks was used to collect more data from the users before analyzing and defining the needs. This method was chosen to reach a broader sample of participants from all over Europe and also to see if there were patterns in

their behaviors when being in certain situation. The text of the survey was written presenting a scenario of a normal day of work, so the participant could relate with it and fill it in with appropriate answers.

The Fill in the blanks' survey was made online and sent out through social network sites (19 different Facebook groups) to be able to reach drivers from different European countries, Appendix A.4. To address the language limitations among the design team and to attract as many truck drivers as possible, the survey was translated into eight different languages (English, Italian, Swedish, German, Spanish, French, Polish and Lithuanian). The translations were made by people who were native speakers in those specific languages.

5.1.2 Define

A total of 70 long haul truck drivers participated in the user research and they were approached through different ethnographic methods, Table 5.1. The participants were from different European countries, being most of them from Sweden, Figure 5.1.

Table 5.1: Amount of participants from the different methods in the User Research

User research method	Number of participants
Survey	52
Interviews	15
Focus Group	2
Field trip	1
Total	70

Throughout the Empathize and Define space each member of the design team presented and discussed their points of view or interpretation on the data they gathered individually; either through: online research, individual interviews or through the field trip. This helped the team to be synchronized with: the information each of them managed, what they thought about certain issue and agreeing on how they should proceed. By doing this, the design team helped each others to remember early findings. After finishing with the data gathering, the design team proceed to structure, analyze and synthesize the data; transforming it into findings, followed by defining the user needs and the design challenge.

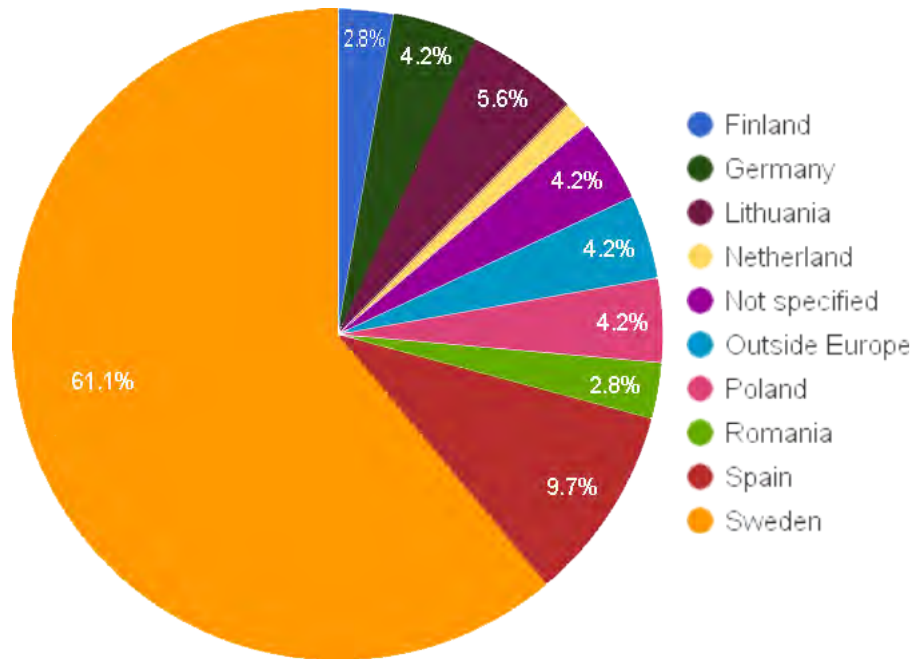


Figure 5.1: Nationalities of the 70 participants from the User Research

5.1.2.1 User Research Analysis

The debriefing process of the data took place by writing in post-its findings from different sources such as: online research, interviews, field trip and focus group. The design team proceed to group the findings according to their similarity between each others, which is known as Affinity clustering.

After clustering all the findings, there was a total of nine different categories which were labeled as: social contact, work demands, relax, decoration, belonging, activities/boredom, home and motivation, Figure 5.2. Each of these categories had from eight to ten findings. These groups were saved and put aside to analyze the data gathered from the survey Fill in the blanks, and afterwards merge all the findings together.

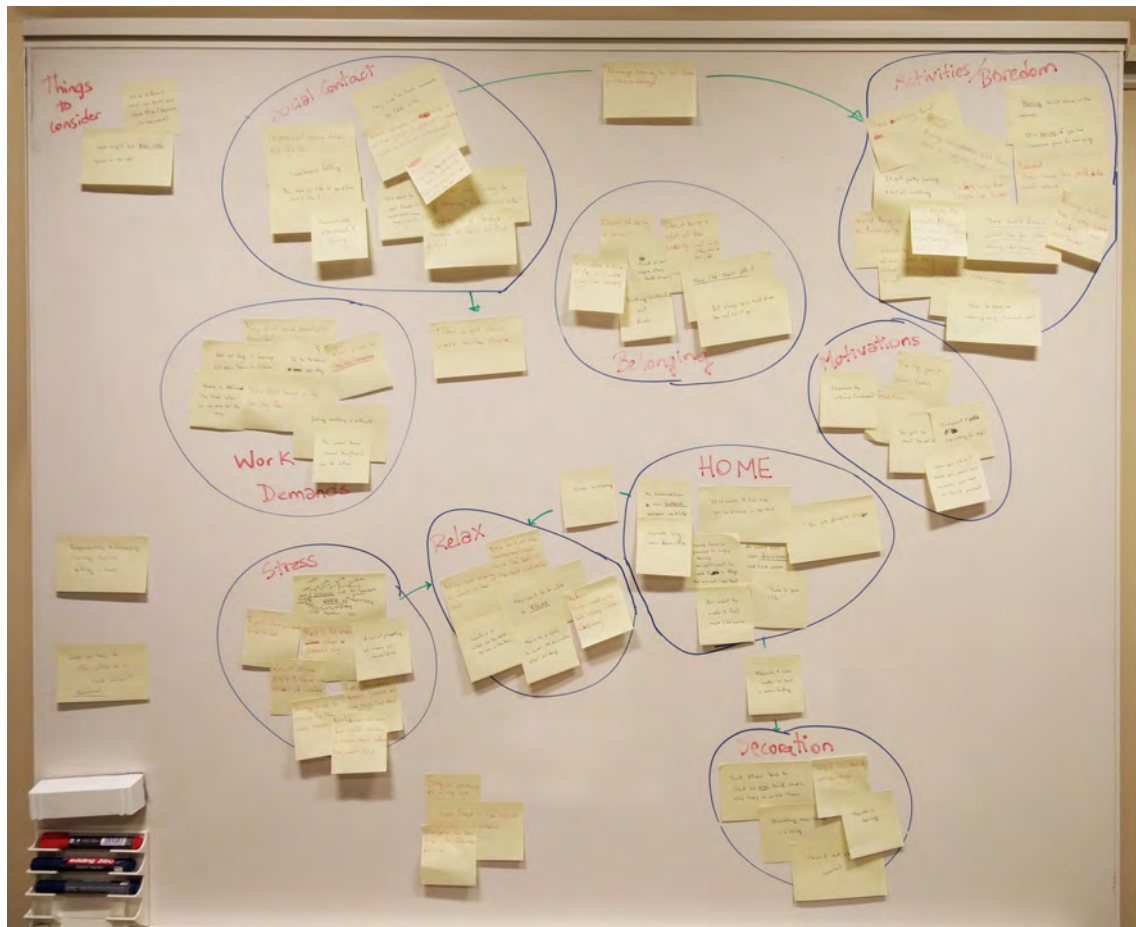


Figure 5.2: Affinity clustering of User Research findings

The analysis of the online survey took place by translating all the answers into English to be able to compare them afterwards. There was a total of 52 survey responses, which was considered a success to get this many answers from different European countries. Nevertheless, more than 50% of the participants were Swedish truck drivers, which implied careful consideration when analyzing or quantifying findings, due to the patterns found in the data could be influenced by culture.

Even though most of the data was qualitative, it was possible to quantify some information, for instance the average working hours of long haul truck drivers. Resulting in that the average working day was around 12 hours/day, which confirmed that truck driving can demands more working hours than other jobs, Figure 5.3. In addition, 40% of the participants expressed that having social contact (e.g. loved ones coming along, meeting people at truck stops) is among the best things they have experienced in the truck.

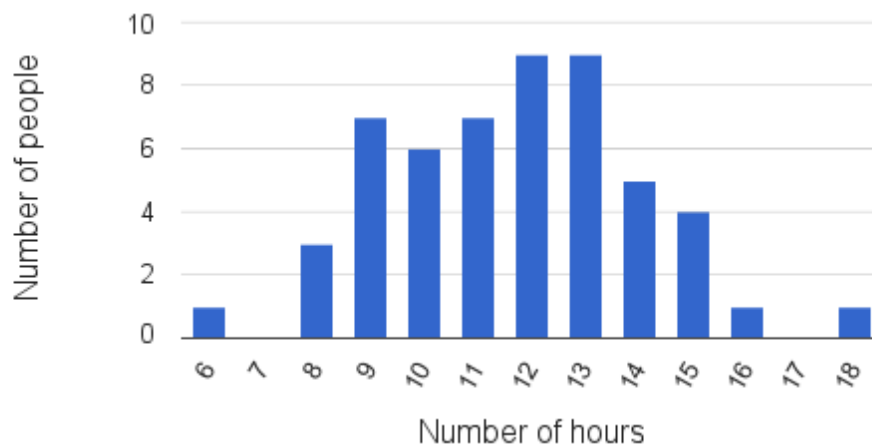


Figure 5.3: Long haul truck drivers average working hours per day

It was a surprise that when the users were asked how they would feel if they have a short day of work (six hours), most of the answers were negative. The design team decided to make a mood graph to analyze and compare how users felt, in which they evaluated several continuous answers within the scenario of having a short day of work (present in Fill in the Blanks survey). The answers per participant were assigned to different categories of being: angry, not so good, sad, bored or happy. It was noticed that very few participants were happy with the idea of having such a long break during the day, Figure 5.4.



Figure 5.4: Mood when having long breaks during working hours

These findings in conjunction with insights from the other scenarios presented in the survey were analyzed and written in post-its to merge them with the previous

categories from the affinity clustering method. Some of the findings did not match with those categories, resulting in new categories.

After patterns and dimensions of user needs were identified with the different clustered groups, the design team proceed to transform them in the form of user needs, by completing the sentence: *"Long haul truck drivers need. . . "*, hence the list of user needs resulted from doing this.

5.1.2.2 Defining the design challenge

After a draft of the list of user's needs was finished, the design team created a Mind map per user need with connections between the different clustered groups to see how they were related to one another. Each mind map represent a broad category to explore further (see Section 6.1).

The design team proceed to analyze each category and evaluate which of them was the most interesting and valuable to focus on according to stakeholders' interests. The categories of the user needs are: Social Contact, Enjoy their hobbies, Disconnect, Relax and Time efficient tools, in which the last three were chosen to focus on. These categories had connection between each others and were chosen to help truck drivers to: enjoy the activities they do, enjoy their free time and lower their stress, Figure 6.2.

To facilitate the idea generation process and to keep the focus on what the final design should solve, the design team framed the design challenge based on the chosen categories of user needs. The design challenge ended up being phrased as:

Help the users to lower their stress and disconnect from work during their free time, to be able to enjoy what they do in the cab.

This design challenge in conjunction with the mind maps of the user needs were presented to the main stakeholder (Volvo Trucks), to get feedback and to be aligned with their interests. They expressed agreement on focusing on the three categories chosen and they were surprised that the design challenge was somehow opposite to what they usually work towards. They mentioned that they often tried to help truck drivers to be connected with their work, specially when users are driving, and it was interesting for them that based on the user needs, truck drivers should be able to disconnect from work when they have free time.

5.2 Developing Concepts

This section presents the methods used to develop three concepts that addresses the defined design challenge. The different steps taken during the spaces of Ideate,

Prototype and Test are described. The three concepts were tested with the target users and presented to the main stakeholders (Volvo Trucks).

This phase of Developing Concepts and evaluating alternatives lasted four weeks, and the final design of this research was inspired and based on the findings gotten in this phase.

5.2.1 Ideation

During the Ideation space two workshops were arranged with designers and with the main stakeholders (representatives from Volvo Trucks). After getting a variety of ideas, from both the workshops and brainstorm sessions among the design team, they were evaluated and transform into concepts, which were later prototyped and tested.

5.2.1.1 Workshop with Stakeholders

A workshop was arranged to get different perspectives and ideas on how to address the design challenge by inviting participants with different backgrounds from Volvo Trucks' pool of employees. A secondary goal of this workshop was to learn how the main stakeholders (Volvo Trucks) usually solve problems.

The workshop was held in a conference room at Volvo Trucks' offices with a defined duration of one hour and a half. It was decided to have it in that workplace to make it easy for the participants to attend, Figure 5.5. To inspire creativity, colorful posters related with the thesis were placed on the walls of the conference room with information displayed, like: the design challenge, user needs and others.

The workshop began with an introduction of this research and the goal of the workshop. To make the participants more comfortable and get into the right mood, an icebreaker was applied. After the participants got in a creative mood due to the icebreaker, the method Concept portrait was applied. The purpose was to get inspiration and ideas to solve the design challenge. Participants were asked what color, place, animal and tool would the solution have or could be to "help to disconnect from work and lower their stress".

A regular brainstorming took place to get an understanding of what the participants saw as interesting paths to develop further. To start getting innovative ideas that looked more as solutions, the method Insight combination was used. For this case, the two sets displayed were stressful professions and activities that help lowering stress. The reason for these two categories was to find solutions to lower stress and disconnect from a stressful profession. A limited period of time to come up with an idea was set to thirty seconds, to force the participants to write the first idea that came to their minds.



Figure 5.5: Workshop with specialists from Volvo Group Trucks Technology

Finally, the method Osborn's checklist was used to further develop some of the ideas gotten from the Brainstorming method. The questions from the Osborn's checklist used were: put to the other uses, combination and modify. In general, this workshop contributed with insights on how to lower stress and disconnect from work, from current Volvo Trucks employee's perspective who have experienced work stress.

From this session it was found that the participants got relaxed and disconnect from work with things related with nature such as environment (e.g. bird sounds), activities (e.g. swimming in the ocean), and so on. Some words that stood out were: fire, water and nature sounds. They also mentioned that having or making a plan helps them lowering their stress, stating that if they do not have a plan they will get stress, no matter if they have a lot or little to do.

5.2.1.2 Ideas from the Design Team

Several Brainstorming sessions were held among the design team using findings from previous workshop as inspiration. Some of the methods applied included Reverse brainstorming, which aimed to get ideas that make people "connect to work and increase stress". The ideas gotten were then clustered into groups and each group was used as a basis to come up with solutions.

Ten out of seventy of the ideas gotten were used to developed further through Osborn's checklist and Power of ten methods, Figure 5.6. From the Osborn's checklist

questions like: reverse, combine and put to the other uses, were used and from Power of ten method the following questions were used: "What if it had to cost more than a million dollars to implement?," "What about under 25 cents?," "What if it was physically larger than this room?," "Smaller than a deck of cards?," "Had no physical presence?," "Took more than four hours to complete the experience?," "Less than 30 seconds?"

Moreover, Brain-writing 6-3-5 method was applied to ideate through sketching and see if by drawing, some ideas could pop-up and inspire the design team. As this consisted of two people, there was only two rounds of iterations when applying this method.

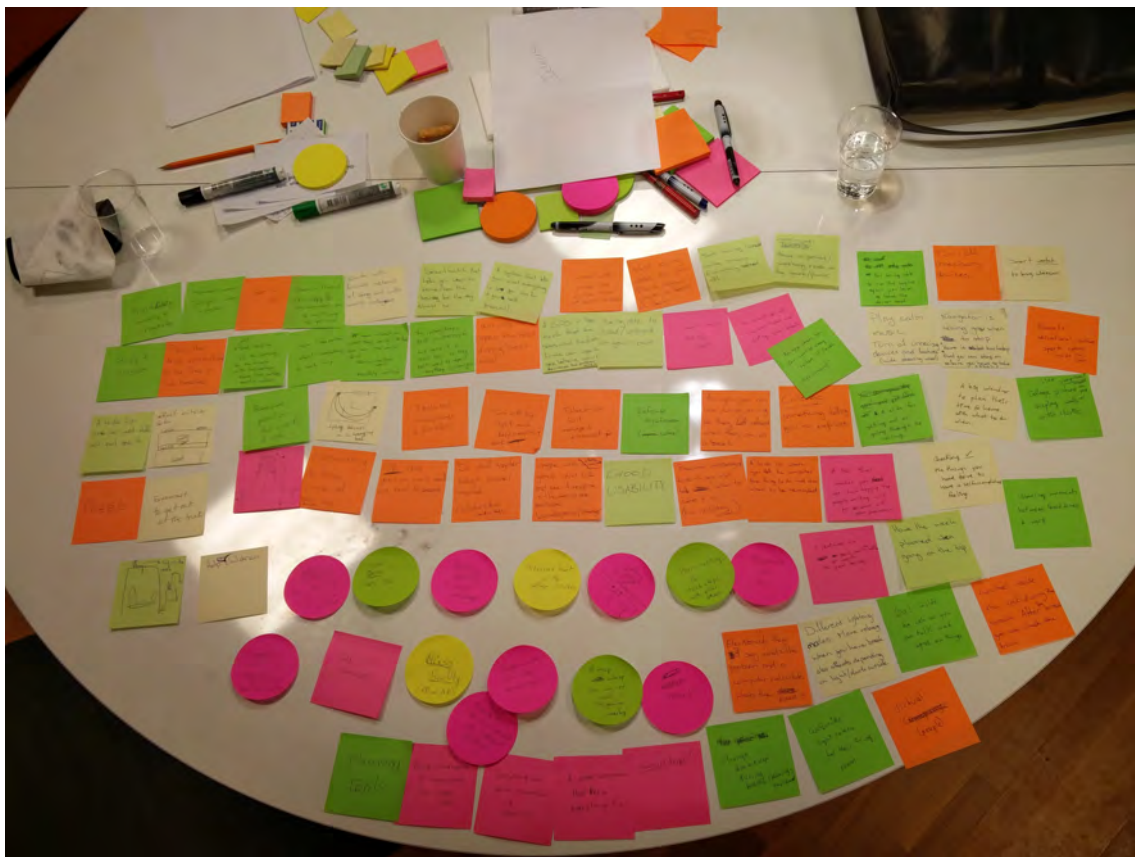


Figure 5.6: Ideas of positive solutions out of the reverse brainstorming

5.2.1.3 Workshop with Designers

In HCD practice, there is a risk for designers of not being able to: envision the future and produce innovative solutions when the research has focused mainly on the user's present situation (Steen, 2011). Therefore, in order to get more futuristic ideas and avoid being biased or influenced with the findings from the user research, a workshop with industrial designers was arranged.

Two designers participated in the workshop, which ended up being a co-design session where everyone was collaborating with ideas. The session started with the Insight combination method, by having written on post-its different types of technologies and superpowers, such as: virtual reality, drones, ability to fly, telekinesis, etc. The participants had to come up with solutions that help either to disconnect from work or lower stress by taking a post-it that had a certain technology or superpower. Each participant had a limited time of thirty seconds to come up with an idea.

Several ideas resulted from this method, which worked as an icebreaker and also to get ideas to evaluate later on, Figure 5.7. The design team brought up three ideas that were previously chosen (before the workshop) to explore further, with the aim of gaining different perspectives and to see if they were worth pursuing. The ideas were related with: a planning tool, talking with people and a wall to display family pictures.

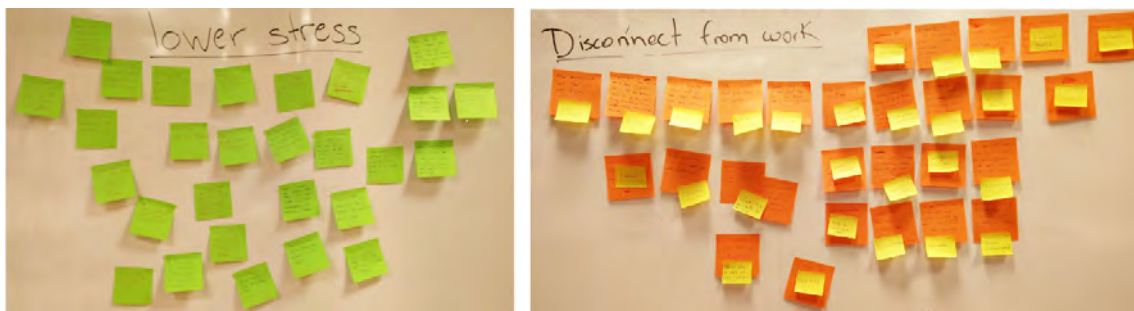


Figure 5.7: *Insight Combination ideas from the workshop with designers*

The design team prepared a list of movie characters to apply Alter ego design method, in which the participants try to come up with ideas on how the character presented would use the product. Characters such as: Homer Simpson, Donald Duck, the Grinch, Tarzan and Smeagol were used to motivate the session and get wild ideas outside of the box.

5.2.1.4 Idea Evaluation

The idea evaluation process started by analyzing the data gathered from the workshop with Volvo Trucks representatives. This was to understand from their point of view, what is important to consider for addressing the design challenge. These findings were used as a basis to evaluate the ideas gotten from the other ideation sessions.

All the ideas (solutions) from the different workshops and Brainstorming sessions were displayed on a whiteboard to see if there was any patterns or similarities that could led to a concept. The ideas were clustered in a silent way, which helped the design team to understand how the other person was thinking without influencing

nor interrupting each other. Once the design team agreed on how the ideas were grouped, they labeled the groups by affinity.

More than two hundreds ideas were now clustered in twenty four different groups, in which the design team looked for connections within the different groups. A Mind map was then created to structure all the groups in a graphical representation to see how they relate to each other and then be able to connect them to the design challenge, Figure 5.8.

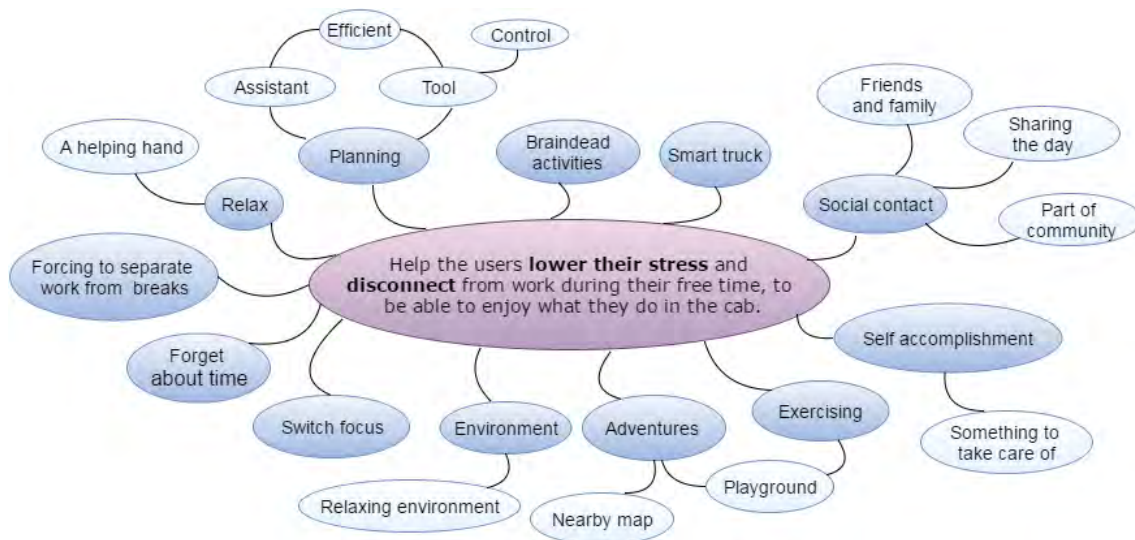


Figure 5.8: Mind map with 24 groups that enclosed 200 ideas

From the many ideas that each group had in the mind map, the design team proceed to choose six groups to explore further. The purpose was to analyze the different ideas each group had and see which features could be combined together to create a concept out of them. The process for choosing groups was by Dot voting considering stakeholders interests. It was an efficient way to narrow down and choose from the pool of ideas, even though the design team was aware that the decision making was very subjective.

5.2.1.5 Transforming Ideas into Concepts

Each group of ideas was analyzed by displaying all the ideas that each contained in a white board and choosing the most interesting features, according to the design team, that could be merged together to create a concept. From the six different groups of ideas, five concepts were developed roughly by making a description and sketches on how they would work, without defining any type of technology or major design details. The different concepts developed were:

Planning Assistant

A smart planning system that keeps every party involved in long haul truck driving connected (truck drivers, haulage firms and their customers). This system is in charge of keeping truck drivers informed with updates related with their work. They are able to see where they have to go next and can communicate with the delivery places (haulage customers), and these ones can view where the drivers are (in case they are delayed). This concept aims to fulfill the design challenge part of lowering truck drivers' stress since it could reduce the time invested in work related tasks (e.g. planning journeys, filling log journal and so on) and hence, truck drivers could enjoy and have more time for themselves.

A Helping Hand

This is a smart system that assists the truck driver with non-work related things. The idea is that everything that is displayed inside the cab (cabinets, refrigerator, bed, so on) is connected to internet and within each others. The system analyzes truck driver's mood and can change the environment by tuning the ambient lights inside the cab, play music and so on. It also reacts depending on the user's needs, for instance: if the truck driver asks for a certain object, the system brings it to him or her with the use of a robotic arm. This concept aims to help truck drivers lowering their stress by influencing the internal environment and by assisting the driver with objects or information that can be found inside the cab.

Adventure and Exercise

This concept presents a tool to motivate the drivers to explore the surroundings of the truck stops where they have parked and where they are planning to spend the night. It aims to encourage truck drivers to move and exercise both inside and outside the cab by providing a competition feature, where truck drivers can gain points when doing physical activities. There is also a leaderboard where they can compare themselves against their friends. This concept aims to address the design challenge through exercise activities and by exploring the nature around truck stops, which was inspired by what Volvo Trucks' representatives mentioned that helps them disconnect: nature.

Sharing your Day

It is a communication tool where truck drivers can talk about their day or about other topics of interest. This tool presents different options (channels or scenarios) that the users can choose from depending on their mood or the mindset they would like to have. Those channels provide an immersive experience, where truck drivers should feel like they are in a different environment and that the other people who are also connected are present and close to them. This tool is for talking only, avoiding texts and other means of communication. Furthermore, it aims to help truck drivers to disconnect from work by socializing and also influencing the topic of conversation, so they do not end up talking about their work. This particular concept could also address indirectly the user need of social contact.

Cleaning Suit

It is an overall suit that can be filled with water for both relaxing and getting clean purposes. This concept aims to help truck drivers disconnect both physically and mentally and by being surrounded with water, it simulates being in a bath or swimming pool. This idea was chosen as a Dark horse idea, which the design team thought was too wild, outside of the box and perhaps not suitable to fulfill stakeholder's interest (Volvo Trucks). However, this concept was kept because it was inspired by findings from the workshop with Volvo Trucks in which participants mentioned that water (e.g ocean, swimming, etc.) helps them to lower their stress. In addition, it was thought that it could address the design challenge by helping truck drivers to relax.

5.2.1.6 Reducing Alternatives

The concepts roughly described and sketched were presented to the main stakeholders, with the interest of getting feedback and to update them with the progress of the work done. Among the feedback gotten:

- It was mentioned that the 'Planning Assistant' is similar to a management fleet product that Volvo Trucks currently offers, however that product does not have any user interface for the truck driver. As it is mainly for the haulage firms, the 'Planning Assistant' concept could be of interest if it tries to improve their product further.
- Internet of things is a trendy topic in which it was mentioned by the main stakeholders that several departments within the corporation were working with, to bring innovation by having objects connected with internet and with each others. Therefore, 'A Helping Hand' concept was not among the stakeholders favorites.
- 'Adventure and Exercise' and 'Sharing your Day' both got positive feedback as they tackle: health problems, which is of great concern and quite visible that is a problem among truck drivers; and social contact, which is known that truck driving implies being alone during work hours.
- It was noticed some skepticism and not so satisfactory feelings towards the 'Cleaning Suit' concept.

Even though these feedback were from the main stakeholders, an appropriate evaluation was needed considering what is of best interest for truck drivers, the design team and for this research in general. The purpose of the evaluation was to reduce the five concepts into three, as developing three concepts was within the objectives of this thesis.

A weighted matrix method was used to evaluate the five concepts, in which the criteria defined was inspired by the design challenge and other goals raised during the design process, Table 5.2. After evaluating each concept separately and seeing which of them got higher value in comparison with the others, the top three were chosen to explore further.

Table 5.2: Weighted Matrix to evaluate five concepts

Evaluation Criteria	Value (0.1-1)	Planning Assistant	A Helping Hand	Adventure & Exercise	Sharing your day	Cleaning Suit
Disconnect from work	1	1*(1)	5*(1)	10*(1)	10*(1)	10*(1)
Lower stress	1	8*(1)	9*(1)	10*(1)	10*(1)	8*(1)
Innovative	0.7	3*(0.7)	6*(0.7)	7*(0.7)	5*(0.7)	10*(0.7)
Realistic (10years)	0.3	10*(0.3)	8*(0.3)	10*(0.3)	7*(0.3)	6*(0.3)
Enjoyment of their free time and activities	0.8	1*(0.8)	3*(0.8)	8*(0.8)	7*(0.8)	7*(0.8)
Entertainment	0.5	3*(0.5)	4*(0.5)	8*(0.5)	10*(0.5)	6*(0.5)
TOTAL		16.4	25	38.3	36.2	35.4

5.2.2 Prototype

Each concept was prototyped to be able to test them afterwards, and the style or level of quality was about the same among them.

Sharing the Day

A paper prototype was made which consisted of two images. The first image was an A5 paper showing the different channels or conversation topics to choose from and the other showed a picture of people in a pub environment (in an A3 paper). The idea was to convey the immersive experience with this last picture, and help the design team to explain better how the concept works during the user testing, Figure 5.9.

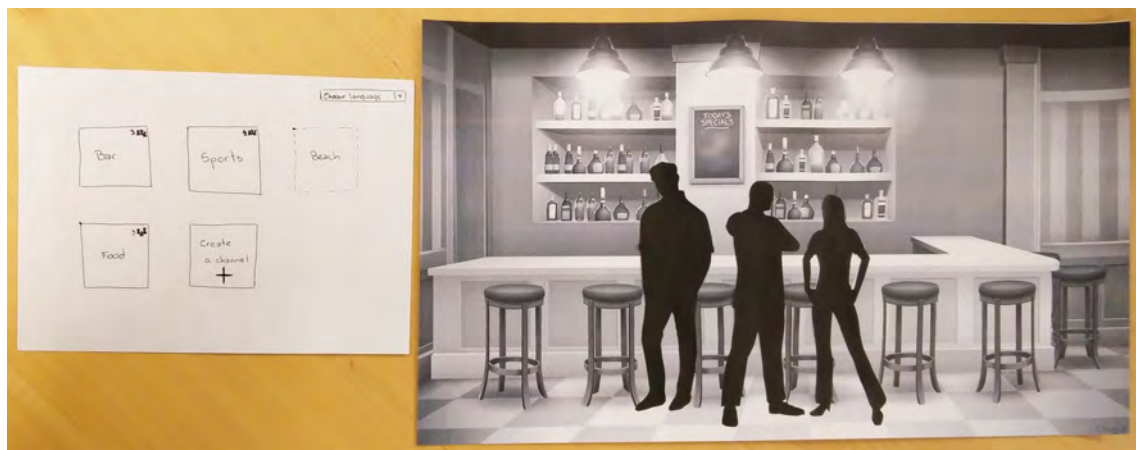


Figure 5.9: Prototype of 'Sharing the day' concept

Adventure and Exercise

The concept was also presented in a paper prototype form in which four screen views were created in A5 paper size. The main view presented a map showing people located in the truck stop and the places where truck drivers could go and visit; from that view truck drivers also saw a leaderboard. The second view showed the list of activities (exercises) that users could do either in the cab or outside of it. The third one showed a notification when an activity had been completed and the last view displayed all the highscores. The idea was to convey the most important features from this concept through the four screen views, Figure 5.10.

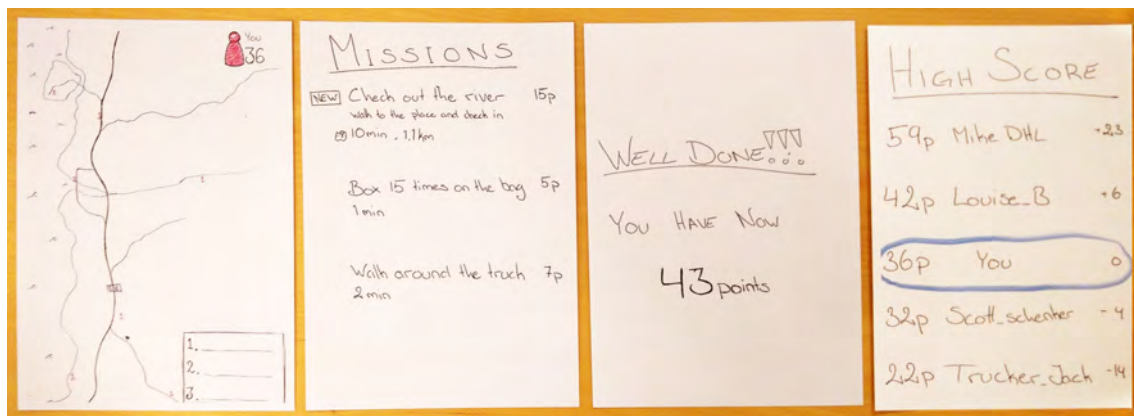


Figure 5.10: Prototype of 'Adventure and Exercise' concept

Cleaning Suit

The Cleaning suit was presented with: a work overall, a water tank made out of a plastic bottle and a water hose made out of straws, which connected the water tank to the overall. The purpose of this was to give the users the option to experience the prototype and the logistics implied when using it in reality (putting on, taking it off), Figure 5.11.



Figure 5.11: *Prototype of 'Cleaning suit' concept*

After finishing the prototypes, a test was arranged to evaluate the concepts and to confirm that they addressed the previously defined design challenge.

5.2.3 Test

The user testing was prepared by defining the learning goals of the test and how the concepts should be tested. The design team decided that an introduction of each concept should be presented to the users, followed by open questions about the concepts and a short survey related with what features are important for the participants, Appendix A.5.

5.2.3.1 Evaluating Three Concepts

The test was held at Sandsjöbacka truck stop (Sweden), in which once again truck drivers were approached when they were inside their trucks. Each concept was evaluated by three people, in some cases one person tested two concepts (if they had enough time available), otherwise they only tested one of the concepts. The testing of Sharing the Day concept and the Adventure and Exercise concept consisted of presenting the paper prototypes while the Cleaning Suit consisted of users experiencing the prototype. However, when the truck drivers were approached, as some

of them stayed inside the cab, it was not possible to encourage them to try out the prototype. Therefore, all three concepts were explained how they work without making the participants to try them out.

Sharing the day got both positive and negative feedback. Some users thought it was a cool idea and they appreciated: being able to talk to people, to meet new people and the change of environment, some of them mentioned that they would like to talk to non-drivers as well. Other users who were not so keen with this concept expressed that they rather talk in real life rather than through technology, that choosing the topic is not important, and that as they already have friends they did not need this product. Overall, what was noticed that users liked the most was to communicate with anyone and some of them wished to add a function where they could do things together.

In relation with Adventure and Exercise concept, the features of competition, exploration of nature and the health aspects were the ones that users like the most. Some participants were concerned about leaving the cargo alone when going to explore places or that the tool would not motivate them to interact with. Some participants recommended to add a way to make friends through this tool.

The testing of the Cleaning suit had to be changed, not only because truck drivers would not try it on but also because it was noticed that some truck drivers related the overall with a work suit, instead of visualizing the potential of the Cleaning suit concept. Therefore the design team decided to make a sketch and use it to explain the concept. Some of the feedback gotten was that water helps to disconnect, it would be nice to use it in winter and that they would use it if they had one. Some of them thought it would be complicated to put the suit on and that the purpose of the concept was to get clean instead of disconnecting from work. A feature most of the participants wanted to add was massage and relaxing sounds.

A total of eight truck drivers participated in testing the three concepts, due to the feedback gotten differed from one another, the design team wanted to confirm that the main feature of each concept solved the design challenge of disconnecting from work and lowering stress.

5.2.3.2 Survey to reassure needs

An online survey was created to know if certain activities helped long haul truck drivers to disconnect from work. The participants had to rate each alternative depending on the level of disconnection that the activity brought to them. Each alternative presented four rating options, this was due to the design team wanted to avoid neutral answers. The activities were related with exercise, meeting people, taking a shower and so on, which were perceived as main features in the three concepts (Appendix A.6). The online survey was published in 16 different Facebook groups and even though the groups were for users from a certain European country, the survey was only written in English.

The online survey got 16 answers in total, in which each answer was analyzed separately to see if there was any pattern per participant. As there was 4 rating options, depending on how the users answered (e.g. the same value to all the alternatives, different values per alternatives, so on), the analysis was done by placing each answer as if they were either positive (help to disconnect from work) or negative (does not help to disconnect from work as much), Figure 5.12.

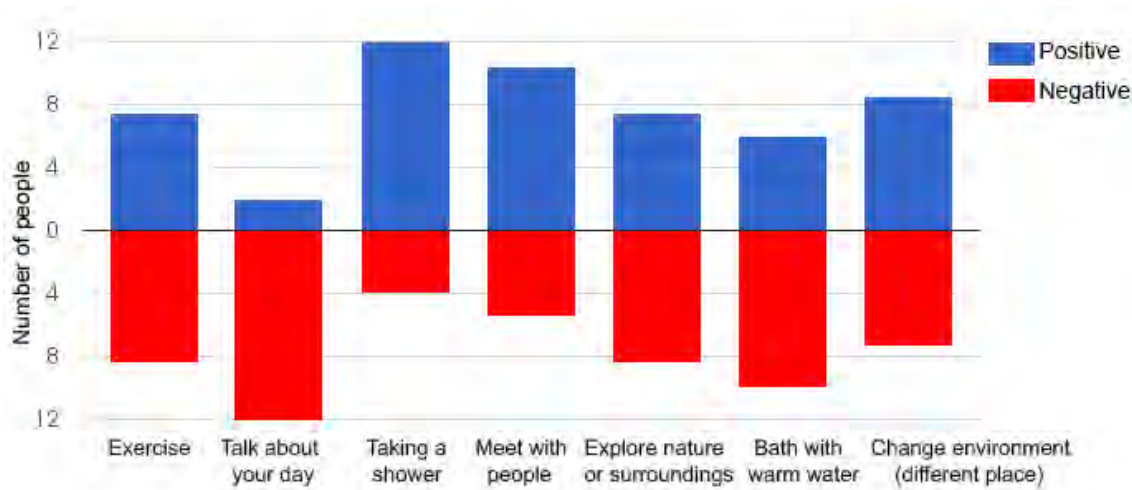


Figure 5.12: Survey results about activities that help truck drivers to disconnect

As Figure 5.12 shows, the activities that help truck drivers to disconnect the most are: "taking a shower" (12 out of 16 positive votes) and to "meet with people" (10 out of 16 positive votes). Since there was skepticism from the main stakeholders (Volvo Trucks) towards the Cleaning Suit solution and also that one of the user needs found in this thesis was Social Contact, "meeting people" was chosen as the main activity to focus on when evaluating the three concepts, without completely discarding the other activities that help truck drivers to disconnect from work. From this a new design challenge was defined in which the final design would be based on, taking the three concepts as a basis.

5.2.3.3 Focus group to evaluate three concepts

A focus group was arranged to test the prototype in a similar way as it was done at Sandsjöbacka truck stop. Two people attended to the focus group and one of them had been present in the previous focus group done during the user research phase. The session started by presenting the online survey posted previously in the Facebook groups, to know how the participants perceived the questions and the thoughts behind their answers.

The online survey did not present any constraint of time or space related with the activities, it was intended to know in general what helps truck drivers to disconnect (leaving room for them to imagine themselves at home or work or other contexts).

It was noticed that the participants from the focus group understood the survey questions as when they are located in a truck stop. Some of their answers were contradicted by themselves during the final discussion of the focus group session, after the concepts were introduced and evaluated by them.

The feedback from Sharing the Day concept was very positive, similar to the positive comments perceived at the truck stops. They said that it is valuable to see the people and that they would even use this tool during their short breaks for relaxation. In addition, both participants saw potential of the Adventure and Exercise concepts as being part of something bigger and stated that if implemented, they would give it a try. They said that they would like to plan their trips depending on where friends are and that perhaps they could get motivated by seeing that other people are doing the activities. However, they did not think they had time to use the tool and definitely not during the short breaks. Furthermore, they mentioned that they would not like to add more things inside the cab, therefore the idea of having a Cleaning Suit was not very appealing for them; they mentioned that when they take showers, changing the environment to the truck stop is part of the experience that helps them disconnect from work, instead of only the shower part.

5.3 Final design

The final design was decided to consider "meeting people" activity to evaluate each of the concepts previously developed, to see what could be taken from them that aids to meet people. This section presents the spaces of Ideate, Prototype and Test from the Design thinking model, which were repeated in this phase with the aim of developing the final design.

This phase lasted a period of four weeks, in which paper and digital prototypes were developed and tested by long haul truck drivers and average people. Each method belonging to the different spaces are described.

5.3.1 Ideate

The idea generation starting by re-framing the design challenge towards the new insight that "meeting people" helps truck drivers to disconnect from work. By formulating a new problem statement, the design team could change focus and allow new ideas to come in, without ignoring previous concepts. The new design challenge was defined as:

Help the users disconnect from work by meeting and interacting with people.

An ideation session among the design team took place, where the three concepts previously developed were put aside while the Physical and geographical boundaries method was applied. The purpose was to ideate features that address the new design challenge and that also consider being in a different context. The contexts used for this method were: a boat, beach, clothing store and a classroom.

From the ideas gotten, the design team proceed to sketch to get more concrete ideas and also to define what form of technology would the final design have (e.g. screen based, tangible product, virtual reality and so on). The purpose was to use or be inspired by the "Sharing the Day" and "Adventure and Exercise" concepts, in conjunctions with the ideas of features gotten with the Physical and geographical boundaries method and try to sketch how they imagined the solution would work.

After sketching solutions, it was noticed that most of the ideas were screen based. From this Brainstorming session, it was decided among the design team that the final product would have the form of a tablet application. This was decided due to it seemed more feasible to implement a tablet application inside the cab and it does not take too much space of it, which was a concern mentioned by the participants of the Focus group, Figure 5.13.

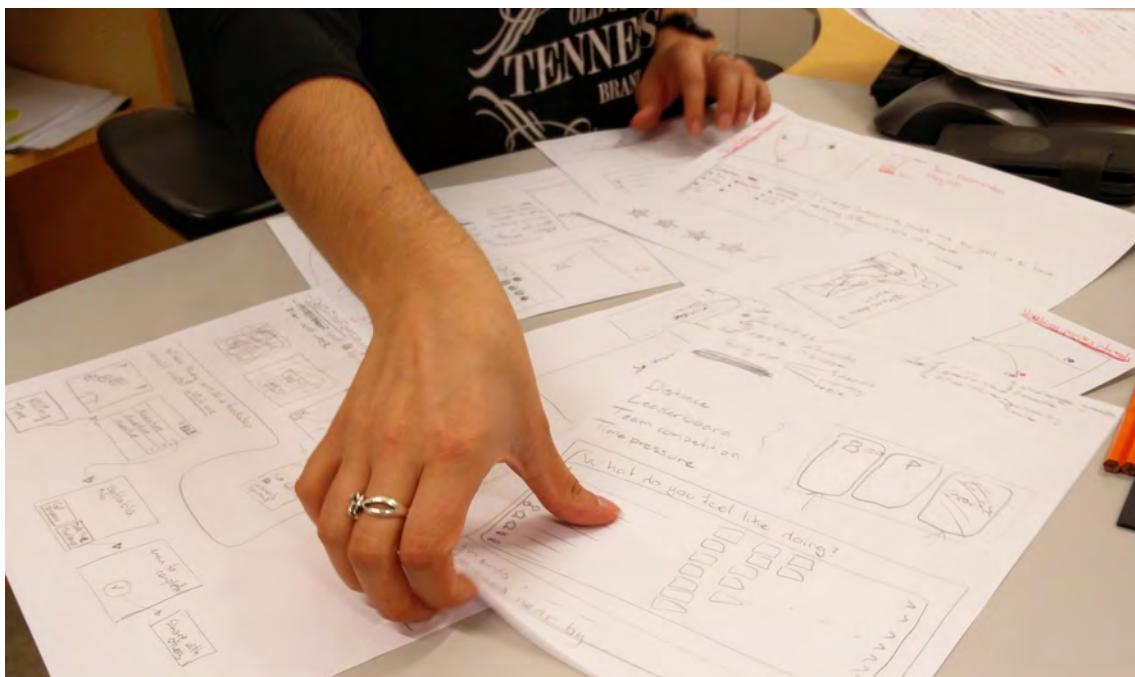


Figure 5.13: *Sketches of ideas for the final design*

5.3.1.1 Early stages of the Final design

After sketching several ideas, a tool that helps truck driver to interact with people through three main features was developed. The features that this tool have are: Hangout, Collecting flags and Collecting hearts.

Hangout feature was inspired by "Sharing your Day" concept and in a similar way presents different topics to talk about, with the difference that the experience would not be immersive. The idea is to provide truck drivers the option of socializing and perhaps meeting people online who have similar interests, considering that perhaps they do not have people to talk with nearby due to language limitations. Truck drivers would be able to create their own groups with friends or colleagues as well, and it was decided that it will only be audio based to avoid issues with typing. With this feature they can socialize and find new friends no matter which country they are.

Collecting flags feature was inspired by the adventure part from the "Adventure and Exercise" concept. Since the design challenge was towards meeting people, both people nearby (who speak the same language as they do) and friends are always displayed in the main view showing the distance from them. This feature would support truck drivers to meet their friends and provides the option of meeting other people who are at the same truck stop. In addition, it aims to motivate them to change environment by showing them places where they can go and explore the nature, and also by showing a leaderboard.

Collecting hearts feature was inspired by the exercising part from the 'Adventure and Exercise' concept. The idea with this feature is to motivate truck drivers to keep in contact with friends, instead of only exercising, by allowing them to challenge their friends and keep track of the challenges they do with a leaderboard.

5.3.2 Prototype

A paper prototype was created to convey the three main features of the concept, and what can be achieved or done with each of the features, Figure 5.14. The idea with the sketches was to present a proof of concept, even though the visuals or the placement of the content was not defined yet. Nine different views were made, some representing the screen views in the tablet and some for smartphone views, as it is thought that they could be connected.



Figure 5.14: Paper prototype of the final concept, the first row shows the Hangout feature, the second shows the Collecting flags and the third show the Collecting hearts

5.3.3 Test

The last test with truck drivers was done in Sandsjöbacka truck stop to evaluate the concept and some content presented on it. The test consisted of presenting a scenario with different use cases on how and when the participants could interact with this tool and for what purpose, followed by open questions to get feedback about the concept, Appendix A.7.

The test began reading the scenario out loud to the participants while showing them the paper prototype and pointing out which view would come next. A total of five truck drivers evaluated the concept and the feedback was mostly positive, especially towards being able to see their friend's location. Some of them mentioned that by having that information at hand, it could be easy to arrange meeting their friends nearby with some adjustments in their planned route. One participant from the test expressed:

It is very useful when you know where your friends are, you know. Let's say I am passing some parking, you know. I'm gonna park up somewhere and if I know where is my friends, you know. So I can go there, you know. (participant from the test of concept, personal communication May 2, 2016).

Collecting flags feature was the most popular and favorite among the participants, where only one out of five mentioned that he did not like the feature that much, and all the other were mainly focused on that one. Hangout was also appreciated by most people, even though they could not imagine themselves using it, they can see the benefit that it could bring to those truck drivers who do not have anyone to talk with. However, in the scenario of the use case of the Hangout feature, the topic chosen was to talk about 'Football' and many participants expressed that they did not like football, therefore they got distracted to follow what the feature was about due to the example of the topic.

It was noticed that the participants were not very interested towards Collecting hearts feature, mentioning that they did not relate the leaderboard as a motivation force to do activities and that they had a very busy schedule to exercise. However, one of them mentioned that seeing their friends score higher than him would encourage him to do exercises just for fun of having more points than his friend, even though he does not like doing exercise.

5.3.3.1 Digital Prototype

After realizing the potential and benefits that this concept brought and how the different features were appreciated depending on the user who tested it, improvements on the content followed. It was noticed that some participants thought that the three features of the concept represented three different applications, and this could be due to how they were presented in the previous prototype. Therefore, the design team proceeded to work in making them look more connected as one unite concept that has several options yet work towards the same aim, social interaction.

The following steps taken were to structure the content and define navigation, considering view styles (e.g. list, cards), design principles, recommendations for landscape displays and so on. The design team proceeded to sketch and agreed on how the application would work, considering that the different activities should look connected and that there should be a standard between the visualizations. A total of 15 screens views were created to understand the navigation structure, and from there a digital prototype was developed.

The digital prototype consisted in transforming the sketches made in paper into digital pictures where interactivity could be added with a prototyping tool. A total of 26 pictures were created by taking images from Google and arranging them together with the purpose of conveying the concept. It was decided to keep a flat design style to present the prototype as simple as possible. A scenario where a truck driver performs certain tasks was used to have a structure on how the prototype should respond if a person tries to interact with it. The software Invision was used to make the interactive prototype in which the 26 pictures were added and gestures like tapping were used to connect one picture to the next one.

5.3.3.2 Evaluating Digital Prototype

The idea to test the digital prototype was to evaluate the content shown, if it was understandable what the purpose of the application was (and therefore if it was intuitive), and also the structure of the navigation in its early stages. A 10" tablet was used in conjunction with a smartphone to simulate the behavior of the mobile application. It was decided that the test will be applied by having a list of tasks that the participants had to perform, considering that the digital prototype would allow to perform those tasks successfully. After the tasks were done, few questions would follow, Appendix A.8.

Because of the short time and due to the purpose of this test was related with content and navigation, the design team decided to test the digital prototype with people who was not necessarily a truck drivers. They also believed that representatives from Volvo Trucks would be suitable as test participants due to they already have some knowledge related with either truck driving and its challenges or with truck drivers' lifestyle.

The test took place in their office and a total of five people evaluated the prototype. This was a diverse group in terms of age, gender and tablet application expertise.

5.3.3.3 Analysis of User Testing

There were several issues that participants experience when performing the tasks instructed to them. Most of them were related with usability, such as: the use of gestures that were not enable in the prototype (e.g. dragging, long press, scrolling), tap on buttons that were not interactive and did not found the ones that were or confusion due to the placement of information. However, the overall impression of the participants towards the concept was that most of them understood that it was a social application. When the participants were asked to explain its purpose, four out of five said that it was for connecting people, for finding people nearby with similar interests and socializing with colleagues, and the last one interpreted it as an entertainment application for truck drivers to get fit.

The participants came up with several recommendations on features, and most of them were already thought by the design team during the concept development stage, where some ideas were kept and others discarded from the concept. As the concept was not explained in detail to them, they did not know that some of their ideas were thought through and were part of the final design. Some of those ideas included visualizing online status of friends who are connected to the application, being able to create new groups from each category and having a map to visualize friends. Some ideas that the concept does not have and were not considered before was to allow the users to take pictures of the places they visit and also have a link to a website with more information about the places.

The final concept got positive feedback, and in terms of content it was noticed that it had the right amount of information displayed. Some participants mentioned that it was simple enough to perform the tasks and that it had everything that is needed to use the application when implemented. It needs more work in the graphical interface design and affordance on the parts that are interactive, but overall was good as a proof of concept.

Among all the feedback, there was one that the design team have thought through and agrees that it could bring more value to the application, which was also mentioned during the last focus group. A participant mentioned that it would be good if the map visualization displays what he called "*predictive routes*" (participant from user testing, personal communication May, 2016), which would help the drivers predict the future according to how it is planned, to be able to see where the truck drivers' friends will be in the following hours or days, to plan their trip to meet them. The design team sees the potential on allowing truck drivers to plan their trips according to where their friends are and this could be implemented if merged with the already existing fleet management system (Dynafleet) that Volvo Trucks offers. However, this product is now offered to haulage firms only, to plan and manage the drivers routes (AB VOLVO, 2011), so it could be a future use of this product.

After analyzing the feedback of this user testing, refinements on the final concept were made. The design team noticed that even though there were many slides showing the structure of the navigation and content of the final design, there were still some details that were not clear among the design team, in which each member had a different interpretation of the matter. Therefore, the discussion helped to clarify those details and define the final concept.

5.4 Reflections on the Process

In this section reflections and recommendations related with the methodology applied are presented

5.4.1 Design Model

The Design Thinking model introduced by Plattner (2010) worked perfectly well with the five spaces that it presents. It was easy to move from each space and iterate in the process and at the same time, it was convenient for explaining the steps taken in a chronological order. Comparing this model with the Luma model which presents three spaces of: Looking, Understanding and Making (LUMA Institute, 2012), by having five spaces in the Design Thinking model, makes it easier to present an easy-to-follow process considering the reader's perspective. If compared with the HCD model that IDEO presents, which also have three phases IDEO (2015), the

Design Thinking model feels more like an iterative process and it is neither focused on business analysis nor launching a product, rather designers choose when to stop their process. It is recommended when having a HCD approach to look into the different process models that exist and consider not only the methods that they present but also how can you motivate and explain your process to others.

5.4.2 Approaching Users

The design team visited truck stops four times to speak to long haul truck drivers. There were several parameters found that could have influenced the data collection at the truck stops. One of them is the barrier that was felt present when interviewing truck drivers. This happen when they were in their trucks and the design team was on the road level, in which sometimes the drivers had the engine on. This made it difficult to engage them in the interviews for long period of time. The weather condition was also noticed to influence their interest in participating and talking with the design team. When there was nice weather, truck drivers were more eager to help, and even go out from their trucks to talk closely with the design team. At last, the use of reflective jackets with Volvo Trucks' logo brought confusion to the truck drivers, thinking that the design team were guards of the parking lot. After some truck drivers agree to participate in the interviews, there were still some tension perceived from them, this tension was only noticed when wearing those jackets.

Another limitation that was noticed at the truck stops when approaching truck drivers was that most of them only spoke their native language. Therefore not everyone that wanted to participate was able to be engaged in a conversation with the design team and hence contribute with this research. This induced that the test sessions were not very time efficient as well, the design team spoke approximately with three participants every two hours. Only the truck drivers that spoke either English, Swedish or Spanish were able to be interviewed. Most of this research considered users who spoke these languages, excluding many people who did not. Perhaps the reason for why some of them spoke these languages and some other did not could be related with their educational level, which was not considered during this project and therefore, it should be explored further to know if the data collected and the user needs would have differed depending on truck drivers' language skills.

Arranging focus groups with truck drivers was challenging, to find their contact information and be able to schedule a time that suited them. This could be the reason why the focus groups ended up each time with only two participants. van Boeijen et al. (2014) recommend to have from 4-8 people in a focus group and the design team was aware of the benefits a larger group could bring, like more discussions, opinions and insights could have appeared. However, it was still appreciated and beneficial to hear the point of view of at least two truck drivers. Moreover, there was another factor present that might have affect the outcome from the focus group, which is that the participants had a boss-employee relationship, one was the owner of a haulage firm and the other one drove one of the company's truck. Therefore

their answers could have been influenced by that relationship in the sense that the employee might have limit to give positive answers so his job or work benefits did not get affected. Though this was not noticed by the design team during the sessions.

The field trip was not very helpful in the sense that the research was focused on truck drivers leisure time, and by being in the cab when the use was driving, it felt as a waste of time, specially if analyzing the time invested against findings gotten. A field trip with only one user will revealed only one person's behavior which cannot be said it represents the users in general. Moreover, the idea of doing more field trips was considered time consuming and not beneficial for this thesis as the users would not behave as they normally do during their breaks. Even though more insights and empathy towards truck drivers' lives and work could have been revealed, they would probably be more related with the user's work situation rather than their free time.

Fill in the blank method was applied to reach out to a broader group of users. But since the survey was translated from English to the other languages, there is a high risk that the content of either the questions of the survey or the answers were mistranslated. This could have led to misinterpret information and lost data or their real meaning, which adds more uncertainty to the results due to surveys are already not very reliable. In addition, this survey was posted on social media sites, which implied that only truck drivers who actively uses internet and were members of the groups where the survey was shared, were able to fill in the survey. This could have excluded a great amount of truck drivers who were neither part of those social media groups nor use internet that often, and therefore the solutions developed might not suit them because of this.

Overall it was very challenging to approach truck drivers in general, especially at truck stops considering that the time they have for breaks is quite limited, that their work is quite demanding and also language limitations. It was difficult to know where to start looking for them by other means as well, when covering such a global area.

5.4.3 Evaluating ideas

Testing the three concepts was done by showing and explaining how the product would work through low fidelity prototypes. Since the concepts involved: being in a suit filled with water, physical activities or social interaction, it was hard to gain valuable feedback from the users as they were not able to experience them. They could only imagine and try to visualize themselves using them. The design team believes that if participants would have been able to experience the main features of each concept, the feedback would have been more reliable and based on their real experience. In addition, it is thought that due to they do not have have these concepts implemented in the cab, it is hard for them to envision the benefits and usability of the concepts.

During the same test of the three concepts, a survey was handed out after interviewing the participants. The results from the surveys and even their answers during the interview might not be very reliable because they might have what (Nancarrow & Brace, 2000 referred in Tullis & Albert, 2013) defined as "social desirability bias". This means that the users could have responded more positively towards the concepts than they actually felt, to try to please the interviewees who was the design team. It is thought that this could have been present in most of the tests and presentations made to users, other participants and even stakeholders, where the feedback was most of the time positive. Although, there is the possibility that how the tests took place and how the questions were phrased could have also influenced on the results.

Different people tested different concepts, resulting in that perhaps the results of the tests would have been more reliable if one participant tested the three concepts each time. However, this could also bring the risk that participants lose interests while the test is ongoing, especially towards the last concept that is presented to them due to the time taken from them. Each approach has its advantages and disadvantages, the reason why it was done this way, was due to time limitations on truck drivers break time, which should be considered when testing ideas with this particular user.

In the last online survey sent where it was asked what activities make truck drivers disconnect from work, surprisingly the option "Talk about your day" got very few votes as not being among the activities that help them to disconnect the most. The design team related this activity to 'relieving stress' by sharing and letting go any thoughts that upset their minds. However, one possibility is that the participants understood it as talking about their working day which of course does not disconnect them from it. Because of the risk of misunderstandings and impossibility to check what the participants meant, the design team did not completely discarded this activity for the final design, however it should be explored further to confirm that it does help users to disconnect. Moreover, this is a drawback when applying online surveys, of neither being able to fully understand the answers nor make sure that the participants understand the questions. It is thought that if applied again, the survey should have requested contact information from the participants to be able to reach them in case further explanation is needed and also to start building a pool of testers of European long haul truck drivers.

Methods like dot voting and weighted matrix were used to reduce the amount of ideas and be able to move forward. They were beneficial for this thesis in the way that they helped to make fast decisions and keep up to date with the project deadlines. However, the evaluation was very subjective, therefore content wise there is the possibility that many good ideas were lost or discarded due to using this method. In addition, the evaluations were made among the design team who tried to understand users needs and stakeholders interest, however they could have been biased towards their own ideas when evaluating them.

5.4.4 Final Design

Evaluating the digital prototype was made through a post-task interview, being the first question related with what they thought the application was about without giving any introduction on the matter. Most of the participants related the concept with a social application, however there is a possibility that what they mentioned was influenced by showing them the main view of the digital prototype rather than due to the exploration they experienced through the tasks. It was noticed that one of the participant that looked inexperienced with tablet applications and was putting a lot of effort to manage the tasks, did not completely understood the purpose of the application. The design team also believes that by performing tasks in general to evaluate usability, it is possible that participants do not have enough time or focus on the content that is presented to them, therefore their evaluation on the concept and content of an interface might not be very objective, as they might be more focus on doing well on the tasks.

Each of the tasks involved several actions to be performed by the participants, and it was noticed that they made several navigation mistakes when trying to accomplish those tasks. This could be affected due to there were too many actions involved in one task or the fact that the tasks were read to the users instead of presenting them in a written format. This could have lead to the participants having a hard time to remember all the actions involved in one task or the order of them, remembering the last action read and therefore try to perform that one at first.

5.4.5 Recommendations

There were many stakeholders involved in this thesis, which made it harder to move forward in a fast pace. Trying to satisfy all the stakeholder requirements and interests, or even just considering their feedback was challenging as sometimes they contradicted each others or their interests were just different. Among the most challenging task, there was balancing between the users needs and the main stakeholders (Volvo Trucks) opinion.

Introducing yourself as a 'student' when approaching users was found helpful in the way that users were often more welcoming and willing to help. This was noticed when approaching truck drivers and mentioning that the thesis was a collaborative work with Volvo Trucks as oppose when saying that it was a thesis work for master studies. It was noticed when mentioning 'Volvo Trucks' that truck drivers focused on the brand name and started either mentioning that they did not use a Volvo Truck and hence they would not be able to help much or they start comparing facilities among different truck brands.

Even though some methods and steps taken throughout the process could have affected the data collected and hence the results, the design team are still certain that the right needs were found. One reason is because of different methods used often led

to similar results, which confirms that the design was on the right track. Another reason is due to the high number of truck drivers from different countries that participated and contributed with this research, making the results well grounded, even though most of the data collected was qualitative.

6

Results

In this chapter the results that answer the research questions of this thesis and address the design challenges defined throughout the process are presented.

6.1 User Needs

This section presents the users needs found after culminating with the user research on European long haul truck drivers, where a total of 70 drivers participated. The user needs were identified by focusing on the context when truck drivers are not driving but they are spending their free time on the road (e.g. in their truck cab). The design challenge defined from these needs is also introduced.

The different user needs are presented in the form of mind maps due to some of the needs are correlated with one another. Therefore, that correlation can be perceived and explained better with mind maps visualization. There are five domains of users needs, and each of those domains have a variety of causes.

Social contact

As the user's work implies being alone on the road for several days, truck drivers expressed the need and interest of having social contact either with family, friends and in some cases with anybody that they can talk with. It was noticed from several truck drivers that they highly appreciate to be accompanied by family members when they are on the road. In addition, even though some of them can communicate through phone and social networks, having people physically close to them is needed. Other reasons of why social contact is important for truck drivers can be seen in Figure 6.1.

Enjoy hobbies

Several truck drivers who participated in the user research phase mentioned that they would like to be able to practice or enjoy their hobbies during their free time, but due to situation of being on the road, having a limited space available in the cab and being far from their homes, it is not possible for them to do so. Therefore, this is the second domain of needs that was targeted, Figure 6.1.

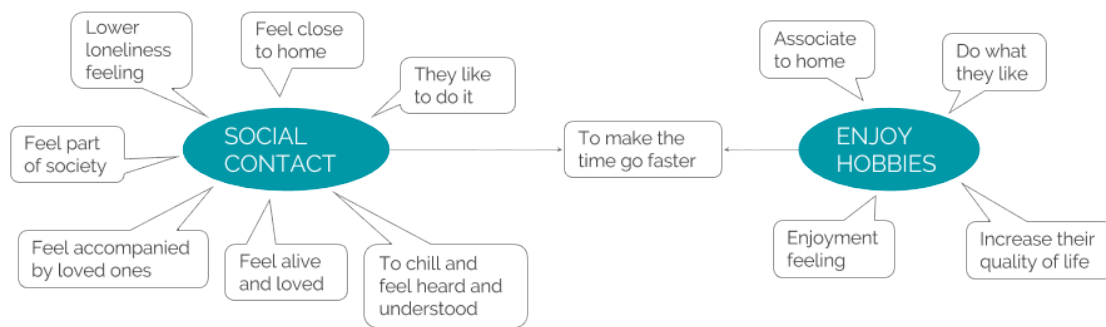


Figure 6.1: User needs part I - Social contact and hobbies

Relax

Truck drivers also need to be able to fully relax after finishing their work day or even when having a break during the day. Truck drivers are often stressed with work and its demands, and whenever they have time off they usually start filling in log journals related to work. Several truck drivers expressed their negative feelings towards having long breaks, because it means they will not be able to work as much or they might not get paid as they expect and so on. If they have a long break, they will do activities to entertain themselves (e.g. watch a movie, play with the phone, so on), but it is still not fully appreciated. They do not enjoy the activities they do because they cannot fully relax, which leads to the next need, Figure 6.2.

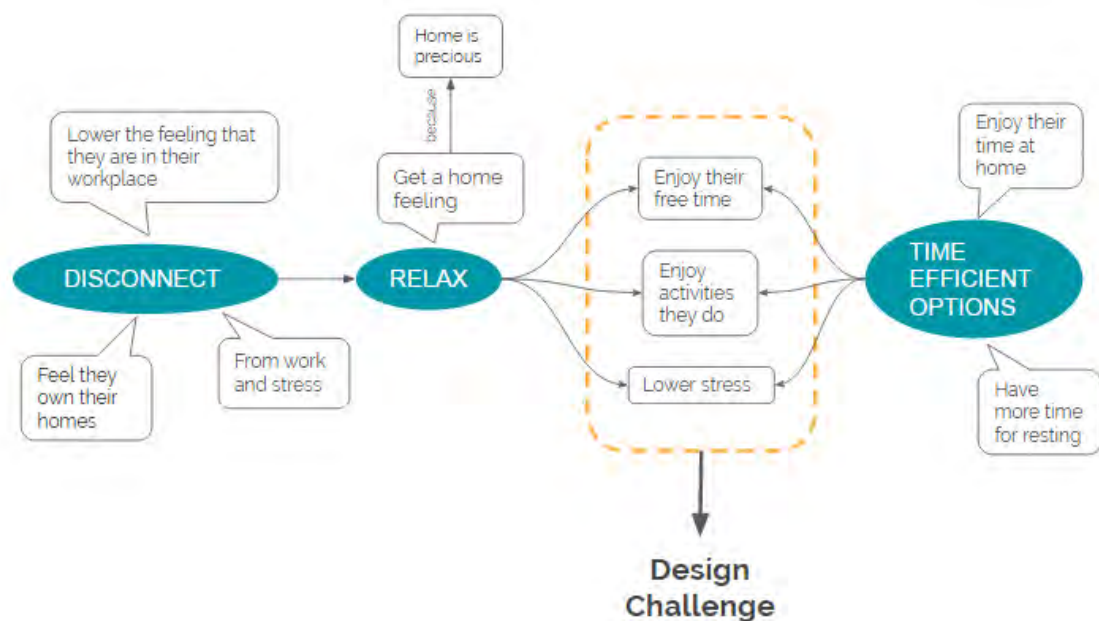


Figure 6.2: User needs part II - Disconnect, relax and time efficient tools

Disconnect

Truck drivers need to disconnect to be able to relax, and this means to mentally disconnect from stress, work, concerns and so on, but also that they feel they are

physically disconnected from work even though they are in their workplace for several days. They should be able to feel like they are in a different environment after the work hours are finished and the home or leisure hours begin.

Time efficient options

At last, truck drivers need time efficient tools so they have more time for themselves and therefore can enjoy their free time without worrying about work or performing work tasks (e.g. plan the route trip, etc.) and also to have more resting time.

These five domain of needs were analyzed and evaluated, and a design challenge resulted from that evaluation. The design team decided to focus on the three main needs of disconnect, relax and time efficient tools to help the users: enjoy their free time, enjoy the activities they do and lower their stress, Figure 6.2. The reason why social contact was discarded was due to it has been a point of focus of other people and the design team wanted to focus on something novel, and the reason why enjoy hobbies was discarded, was due to it differs from person to person, and some of the hobbies mentioned by truck drivers implied a lot of space (e.g. playing drums, motorcycles, mechanic workshop).

6.2 Concept development

The design challenge from the users needs was defined as:

Help the users lower their stress and disconnect from work during their free time, to be able to enjoy what they do in the cab.

This section describes three concepts that were developed to address the defined design challenge.

6.2.1 Adventure and Exercise

The first concept is called Adventure and Exercise, and it is a tool to motivate truck drivers to explore the surroundings and to exercise once they have reached a truck stop. This tool offers options of exercises to be done either inside or outside the truck cab, and of places to walk to. To motivate the users, they can gain points by doing exercises or going to the places, and the amount of points they can gain depends on the effort needed (e.g. distance, number of repetitions, etc.). There is a leaderboard visible to all the users, so they can compare with others. Some examples of the exercises that this tool offers can be boxing, dancing carpet, pulling weights, walking, push-ups, climbing, jumping and so on, Figure 6.3.

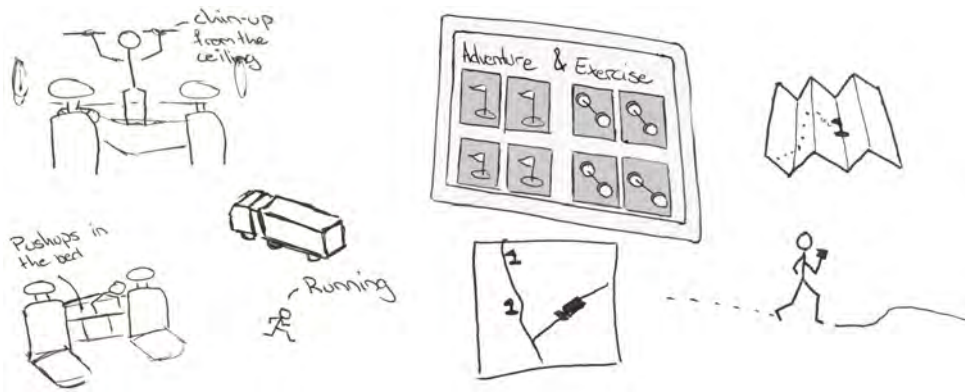


Figure 6.3: 'Adventure and Exercise' concept

6.2.2 Sharing the Day

This is a communication tool to talk about your day or other interests among truck drivers. The experience when talking should be immersive, so truck drivers feel close to others who are in the same conversation and also feel like they are in another environment (different from the truck cab). The tool should provide different topics, environments or groups to choose from, so the users can pick depending on their mindset or interest. The topics can be for instance: 'after work' environment, 'food' topic or 'football' group. This tool aims to help truck drivers find friends or others to talk to at any time during their breaks, with the possibility of adding friends after the conversation, Figure 6.4. Moreover, the communication is through talking only, so it gives a more natural experience when being in a different environment.

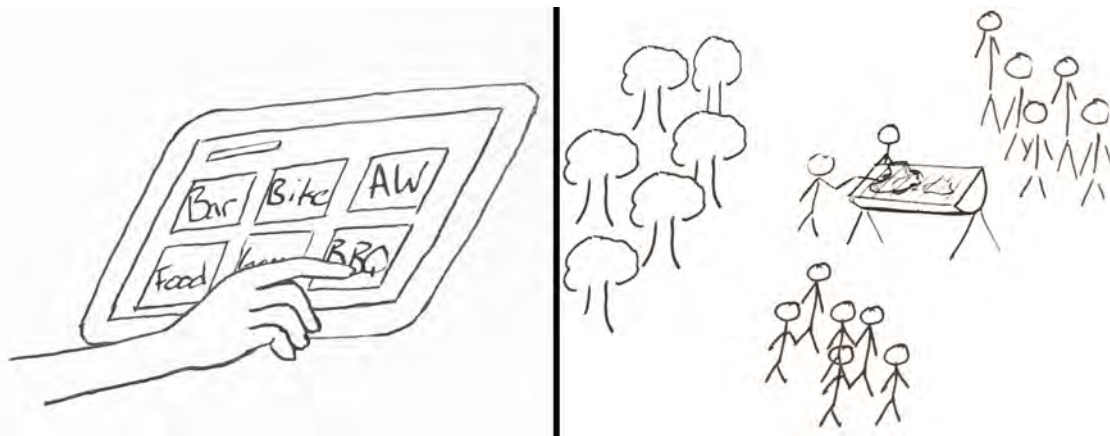


Figure 6.4: 'Share the day' concept

6.2.3 Cleaning suit

It is a suit that gets filled with water, both for relaxing and getting clean. The suit consists of a water hose that connects a water tank to the suit, and the user can

activate when the suit gets filled with water. When the user decides to empty the suit, the water goes back into the tank and get filtered so it can be reused several times (eco-friendly). Besides water, there is also soap in the tank, which can be enabled by the user to fill the suit with soap if wanted. The idea is to offer either a shower or a bathing experience. The suit should be a way to disconnect from work both physically and mentally, by simulating being in a swimming pool or a bath, Figure 6.5.

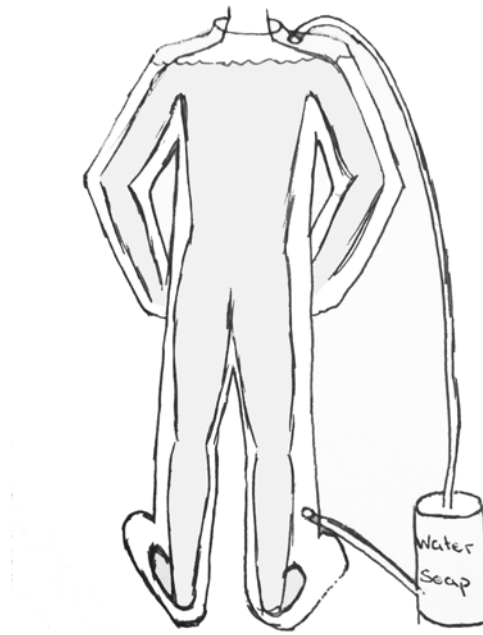


Figure 6.5: 'Cleaning suit' concept

6.3 Final Design

This section presents the final design that addresses the main research question of this thesis. This solution resulted after evaluating the three previous concepts, merging some of their features into one concept and testing it with both the target users and other people.

This final concept aims to solve a new design challenge that was defined from the evaluation of the three concepts. The new design challenge was inspired by the online survey results and was changed so it was possible to adapt the previous concepts to address it, and it is:

Help the users disconnect from work by meeting and interacting with people.

The concept resulted in a tablet application to be placed inside the cab and to be used when truck drivers are not driving. This tablet should be displayed somewhere

inside the truck cab due to the application should be for truck drivers only, to be aligned with Volvo Truck' interests and values, and also to avoid the risk of being discarded or get unused as other mobile applications. This application was inspired by existing applications such as Geocaching, Skype, Find my friends and Runkeeper. Applications with similar features were looked into to avoid making something that already exists, such as Endomondo, Kakaotalk, Zello and Fitbit.

6.3.1 Buddies on the Road

'Buddies on the Road' is a concept of a social application for truck drivers to be used during their leisure time when living in the truck. The tool allows truck drivers to see and find people depending on the language, distance and friend marks. 'Buddies on the Road' will show people that selected the same language in the settings, so truck drivers can start communicating with others or even approach others in their truck cabs without having any language barrier. It shows the distance to the locations where their friends and strangers are. Through these features truck drivers get the opportunity to set meetings or drive to where their friends are located.

'Buddies on the Road' is a tool for truck drivers to interact with each other. In the application they can see who is nearby, and can hang out with them by: inviting other truck drivers to join them to explore places, challenging them to perform an exercise and conversing about certain topics of interest. 'Buddies on the Road' aims to build a network among truck drivers so they always have someone to communicate with. This tool presents three main features which are: Explore, inspired from the 'Adventure and Exercise' concept; Challenge, also inspired from the 'Adventure and Exercise' concept; and Let's talk, inspired from 'Sharing your day' concept.

Explore

As this tool is focused on social interaction, the application shows other truck drivers who are at the same truck stop and suggests them to invite others to explore a new place together. In addition, as there is an indirect need for them to move physically, gamification features were added to motivate them to explore new places. They can collect flags by going to the places recommended by the application (similar to Geocaching) and there is a leaderboard among their friends. The places that are recommended to explore will be walking distance from the truck stops and truck drivers can rate the places or recommend them to their friends.

Challenge

This feature is about sending and receiving challenges between friends to compete, have fun and motivate each other to do challenges of exercises. The number of challenges that can be sent are limited to how many they do themselves, to indirectly motivate them to perform the activities. The Challenge feature is to provide an option to perform activities when they are inside the cab in case there is no interest of going outside of it (e.g. weather conditions or the time of the day). The design team sees this feature as a way to keep in touch with distant friends.

Let's talk

In this feature truck drivers can choose a topic to talk about with other drivers. They can invite friends to a certain conversation or create new topics by themselves. This feature aims to provide an option that does not demand physical activity and also an option for those drivers who are passing by a new country and have no friends or people nearby who speak the same language as they do. The different topics are for them to talk about other things that are not related to their work, and also if they have a certain hobby or interest in certain subject, they can talk about it here.

6.3.2 How does it work?

Once the application is opened (when the truck is parked), information about friends and people nearby is displayed as well as the three main features with several options that they present (Figure 6.6). From this main view, truck drivers can either select people to interact with or an activity to perform. A list of the people nearby is always displayed, and there is also the possibility to see them in a map. The "Explore" activities show places where truck drivers can go that are close to them and a flag is placed on the ones the driver has not visited yet. The "Challenge" activities show alternatives of exercises, highlighting those that are challenges from friends. The last feature on the main screen is "Let's talk", which shows topics to talk about with other truck drivers. The number of people connected in each conversation is displayed, as well as the conversations that have been saved as favorites.



Figure 6.6: Main view of the concept 'Buddies on the Road'

When an "Explore" activity has been chosen, the next view presents information about the place to visit, how many people have visited it before, its rating and if your friends have recommended it, Figure 6.7. From there, the users are still able to invite other people to join them. After deciding to go to explore the chosen place, instructions and a map to get there are sent to the mobile phone. Truck drivers can change the settings so they do not receive instructions in their phones in case they rather have the instructions in the tablet.

In the map view users can see the people who accepted their invitations, so they can easily meet with others at the truck stop. Once the truck driver start exploring and arrives to the place, the application automatically shows that he or she has collected a new flag and shows a leaderboard with the number of flags he or she has, as well as their friends. When returning back, users will get the suggestion to recommend the place to others, Figure 6.7. In the following view they can rate and choose predefined comments that describe their experience.

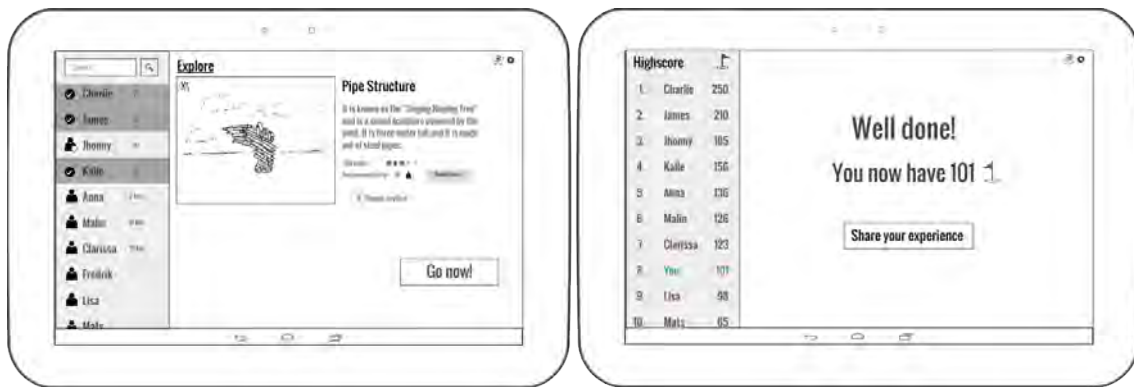


Figure 6.7: Explore activity view (on the left) and Leaderboard view (on the right) from 'Buddies on the Road' concept

When a "Challenge" that has been sent to a truck driver is opened, information about the exercise is displayed. From this view truck drivers are able to accept or decline the challenge, and instructions on how to perform it will be displayed on their phones and in the tablet, Figure 6.8. Truck drivers are also able to challenge their friends by choosing them from the contact list displayed in the main view (Figure 6.6), and choose a challenge for their friends. From there, they can choose a level of easy, medium or hard, which implies a certain number of repetitions of that activity, and hence different amount of points can be gained.



Figure 6.8: Challenge activity view (on the left) and Leaderboard view (on the right) from 'Buddies on the Road' concept

When accepting a challenge, instructions on how to do the exercise is sent to their mobile phones. The measurement to verify that an exercise is successfully performed uses different sensors that current phones provide (e.g. its accelerometer or camera). Once it verifies that they have done the number of repetitions that was required, a leaderboard is shown with the amount of points gained and their friend's points, suggesting users to challenge them or other people. Figure 6.8.

From the main view, once the user choose a "Let's talk" option, it leads to another view which displays information about the group, people connected and the possibility to invite friends to the channel, Figure 6.9. Once they decide to join in, they will be able to hear other people talk and talk back, they can also add that particular channel to their favorites, Figure 6.9.



Figure 6.9: Let's Talk activity view (on the left) and conversation view (on the right) from 'Buddies on the Road' concept

'Buddies on the Road' is a tool for meeting or interacting with people to disconnect truck drivers from work. This tool brings several options of meaningful activities truck drivers can perform to improve their leisure time.

6.3.3 Use case scenario

To explain the use of the application further, a scenario was created showing how and when a long haul truck driver can interact with 'Buddies on the Road' in their everyday lives. Figure 6.10 shows a visualization to the following scenario.



Figure 6.10: Scenario of a long haul truck driver interacting with 'Buddies on the Road' application

Erik is a Lithuanian long haul truck driver who just parked at a truck stop he has never visited before. He is active and feels like doing something, but he does not know what, so he opens 'Buddies on the Road' to see some options on what he can do in that particular truck stop. He notices that there is a nice place to visit not too far away from where he is. He also notices that a friend of his is parked in the same truck stop, he then invites his friend and an other driver who happened to be from Lithuania as well. The three of them walk together to the place 'Buddies on the Road' suggested and are able to enjoy the nice weather, the walk in the nature and a nice gathering with people.

The next day, during Erik's 15 minutes break he is not sure what to do to kill time, so he opens 'Buddies on the Road' once again and sees that his friend Fredrik has challenged him to do 10 push-ups. Normally, Erik does not do push-ups or exercise in general, but since Fredrik has challenged him he will do it just to prove that he can. He later sends a challenge to his friend Fredrik, to keep in touch with him.

The same day after eating dinner Erik feels that he needs some inspiration of new dishes to have them in the cab, since he has been eating the same meal all week. He goes to the Let's talk feature from 'Buddies on the Road' application and chooses the Food group. He joins the group and starts talking to two other Lithuanian drivers who also are connected to that group at the moment.

7

Discussion

This chapter contains reflections on how the results answer the research questions, and brings thoughts on how truck drivers' lives and society in general could be affected from the final design.

7.1 Analysis of Results

In the beginning of this thesis, entertainment was looked into as there was a connection with leisure time. Shusterman (2003) presents three definitions of entertainment, in which the design team chose to focus on two of them: an action that occupies a person's attention agreeably and the one saying that entertainment is what affords amusement or interest. However, it was noticed during the user research that entertainment was not among their main needs, therefore these definitions were used as inspiration to move forward. Truck drivers already had some entertainment alternatives in the cab, but some of them mentioned that they often are bored. This feeling could be due to a lack interest of engaging in entertainment options which can result in boredom (Fisherl, 1993), or it could be due to having monotonous days when living on the road, which Hill and Perkins (1985) mention can increase the leisure boredom.

7.1.1 The Process

The user research included looking into the physical space of the cab. This was beneficial to understand user's behavior and feelings, and also recommended when designing an interactive product to offer a good user experience (Benyon, 2014). The 'Four Space Model' recommended by E. Eriksson (2011) was used to analyze and frame the final design. The design of 'Buddies on the Road' considered the physical space and its limitations inside the cab, and got inspired by trying to offer a social space to truck drivers. It was possible to design a tool that enhances truck drivers' social interaction and that ensures they are able to interact with this tool even though the physical space available is quite limited.

The three concepts that were developed to help truck drivers disconnect from work, were presented to stakeholders and tested with the target users. After getting feedback, instead of improving each of them separately, they were analyzed focusing on the aspect of meeting people. This could have affected each solution by discarding potential benefits that they brought and perhaps as the evaluation consisted of taking features from them, their main purposes could have been lost in the process. For instance, the final design could have been completely different if the focus would have been towards improving the "Cleaning Suit" concept, considering that the "taking a shower" activity was the one that helps truck drivers to disconnect from work the most. But instead of exploring the activity of "taking a shower" further to improve the "Cleaning Suit" concept or the "exercise" activity to improve "Adventure and Exercise" concept, only one activity was chosen to analyze all the three concepts and develop one final from them. This was mainly due to time limitations, however there is a chance that the solution could have been better if improving each concept separately.

The decision when evaluating the three concepts was also highly influenced by stakeholder's feedback, who were somehow skeptical on the potential that the "Cleaning Suit" concept could bring. The design team was aware that by being a "dark horse" idea (which was thought to be very innovative and outside of the box), the chances of not being appreciated were quite high (Zabel, 2015). The action of balancing stakeholders interests and develop a final design that would be appreciated by all the stakeholders involved (including the end users) was within the project scope and it is a responsibility of HCD practitioner to consider this (Salvendy, 2001) when designing. However, it is still a challenge to satisfy everyone.

7.1.2 The Final Design

'Buddies on the Road' concept was tested by truck drivers, but they were not able to experience the social interaction feature or how the application works. Therefore, it can only be said that this tool offers activities that were proven to help truck drivers disconnect from work, and that by disconnecting from work they will be able to enjoy their free time. In addition, further exploration should follow to improve the graphic interface design and evaluate usability, to know if it is an engaging and easy to use tool and if truck drivers would use it for interacting with people.

The different options of activities that the final design offers are: explore the surroundings, challenge friends to exercise and talk about certain topics. All of these options require the users to take an active role on each activities, and according to Vorderer et al. (2004), when users engage themselves in entertainment options that require an active role they tend to do it to challenge themselves and to get an achievement feeling. Therefore, the final design could indirectly influence truck driver's health by making them feel good about themselves through an achievement feeling and also by providing options for them to move and exercise. Besides, exercising was found to be an activity that helps truck drivers to disconnect from work

and it was also highly appreciated among the main stakeholder (Volvo Trucks) to have this health option within the final design.

The final concept was decided to have the form of a tablet application since it does not take too much space to have it in the truck cab and because the tablet according to Banga and Weinhold (2014) is the perfect size for having entertainment outside of the living room. In addition, as recommended by Engstroem et al. (2004), if merged with other in-vehicle systems or applications, it could be cost effective and allow new services to be displayed in the tablet.

7.1.2.1 Future improvements

The design team chose to use a flat design style in the digital prototype to convey the final concept in a simple and clear way, and minimizing the risk of having too much visual load (Meyer, 2015). The people connected within the application are displayed in the top left of the tablet (to encourage user to socialize), which is where Cooper et al. (2014) recommends to place the most important features due to it is where the users look first when navigating in an digital application. In general, the content and structure of the navigation aims to be engaging, coherent, and easy to use to keep the users interested in this tool which Banga and Weinhold (2014) recommend to consider to ensure mobile applications success. However, as truck drivers' expertise on using mobile application is unknown, these design decisions should be more thought through in future steps, to know how familiar truck drivers are with mobile application and to evaluate usability of the final design, as it is known for instance, that flat design could worsen the usability of graphical interfaces (Meyer, 2015).

One feature that the design team realized was appreciated was to be able to use the application while driving, to be able to locate friends while they still are on the road. If this tool expands its use to when users are driving it should then expand its research on safety and distraction issues. To continue with the development of 'Buddies on the Road', besides safety, usability should also be looked into, as Cellario (2001) recommends when designing in-vehicles systems.

In addition, being able to see friends and people's location within the application could raise ethical issues on showing information without their consent and could jeopardized their privacy or feeling safe. This might not be appreciated by truck drivers, hence it should be thought through if it should show this type of information or should allow truck drivers to choose if they want to be seen by others.

7.2 Relevance

'Buddies on the Road' could have a positive effect on long haul truck drivers' leisure time in the cab by providing a space where they can have two different mindsets

or roles: one when working and another when being at 'home' (Shamir & Salomon, 1985, Gkouskos, 2016). By being able to disconnect from work they could enjoy their free time, the activities they do, lower their stress and hence relax. These are among the things the main stakeholders (Volvo Trucks) wants to bring a balance between working hours and leisure time to truck drivers (AB VOLVO, n.d.). The final design considered the need of that balance and work towards making it visible for truck drivers when they are in each mode (work or leisure).

When researching on truck drivers' lives on the road and their limitations and conditions, it was noticed that they have other needs that were neither related to leisure nor entertainment, like access to sanitary facilities, inadequate rest, bad eating habits and exposure to physical, and psychological risks (Broughton et al., 2015). It is thought that even though any of these above mentioned needs were not considered in this thesis, they could have a great impact in truck driver lives and work performance and might as well affect their needs towards their leisure activities.

It is known that the automotive industry is quite slow to implement new changes (Gkouskos, 2016) and that haulage firms often are interested in facilities that generates profits (Christensen et al., 2010). Yet Engstroem et al. (2004) recommends to consider user needs and their expectations when designing in-vehicles systems, whilst Normark (2015) mentions that a more satisfied driver could be reflected on having safer traffic. The automotive industry sometimes ignore users' needs and prioritize technology instead (Normark, 2015). If the economic impact of having safer traffic by having satisfied truck drivers could be measured, considering how beneficial it would be for society in general and for them to have basic facilities in their workplace or home (inside the cab), this could motivate haulage firms to invest more when buying trucks and to automotive industry to prioritize more the user needs when designing in-vehicle systems. In the long run everyone could benefit from this, avoiding truck accidents and enhancing employee's satisfaction.

7.3 Reflections

In the beginning of this thesis it was decided to follow a HCD approach which was beneficial to empathize deeply with the users and to confirm every step taken throughout the process. However, this approach is time consuming and by not defining the form or technology of the final design early in the process (following IDEO (2015) recommendations on how HCD process should start), it felt as an inefficient process. In this research, approximately fifteen encounters with different users and other participants were made to get feedback or to collect data from them. The design team agrees and is aware that this approach would have not been possible to follow if they were working as designers and not as students, due to the time invested in each iteration compared with the results gotten.

The design team consisted of a cross functional group, which Sharp et al. (2007) and S. L. Brown and Eisenhardt (1995) agree to be beneficial when developing

products. Cooper et al. (2014) also state that the particular combination of an industrial designer and an interaction designer is good when the product ends up having a physical form. Even though the final design does not have a physical form, having a design team with different expertise and yet aligned ambitions, made it feasible to achieve the final outcome. It was possible to critically define user needs in which many participants were involved, several iterations took place throughout the process, three concepts were designed and from there, one final design was developed. Achieve as much as this thesis presents would not have been possible if not having such a multidisciplinary team, and the results would not have been the same by having other expertise among the team.

One of the issues that was present in this thesis and brought challenges along the way, was the fact of having such a broad target group and not narrowing it down early in the process. The target users were long haul truck driver who drive within Europe. Even though other type of truck drivers (e.g. the ones who do not sleep in the cab) and several other nationalities were not considered, it was still a very broad group. The target users have different cultures, language, education, salary, ways of living, aspirations, age and so on. The fact that they have the same profession does not mean that they have the same needs. All of these differences resulted in a very diverse target group which aggravate finding and generalizing their needs, hence the final result might not even suit all of them.

Furthermore, the thesis took place in Gothenburg, Sweden which implied that all the meetings were held nearby that city. The user research included people from all over Europe, yet the truck drivers were mainly approached when they were passing by Sweden. This can have influenced the results, where user needs could be associated with the countries they drive by. For instance if in another European country the truck stops are close to the city center, they might be able to explore the city or socialize. Therefore, they might not have the same level of need of 'disconnecting from work' as if the truck stops were where they had to spend their free time. The needs differs also depending on the ability to speak the same language as people do in the surroundings.

7.4 Recommendations

All the user research was based on truck drivers' current situation when this thesis took place, considering the work demands, facilities in the truck cab, work tools and European driving regulations that they experience. It is thought that if any of these change, truck drivers' needs will also change and therefore a new user research should be done. Even though the final design might still be usable by truck drivers during their leisure time, they might not have the need of disconnecting from work anymore. For instance, if self-driven trucks are introduced, the task of driving might not be as important as it is now (Normark, 2015) and there might not be much stress related to traffic jams or car accidents, or stress with work in general. This could also happen if other facilities are introduced in the cab like more space available,

wifi, bathroom, so on, or if European regulations changed for truck drivers' benefit.

'Buddies on the Road' aims to help to build a network among truck drivers so they can communicate with each other, take the most advantages of their trips, find support with friends, and get recommendations on which places to go. In general, it aims to make truck drivers feel part of something, however, an ethical issue that could arise is that by being exclusive for truck drivers use, it could have the opposite effect on them, on making them feel excluded from society rather than special to have something only for them. Another consideration is that their work performance could be influence by the use of 'Buddies on the Road', being either improved by having an enjoyment feeling during their free time, or neglected by bringing distraction with the gamification features and by allowing them to see and meet their friends nearby while they are at work.

Advantages related to health and enjoyment feelings that 'Buddies on the Road' offers could perhaps encourage other people to start a truck driving career. In addition, the stereotype or mental model that society currently have regarding truck drivers could change positively. However, because this research only encloses a proof of concept, these benefits should be explored further.

During the entire research, safety and distraction concerns were not looked into, even though any design development for in-vehicle systems should consider it (Cellario, 2001). As the context of use was defined when truck drivers are not driving, the ethical issues mentioned in the beginning of this thesis were considered but they were not tested. The possibility that 'Buddies on the Road' is used when driving is latent, and if there are plans of implementing this tool, more analysis and user tests should take place to see if they would use it when driving, and in that case, make sure that they do not get distracted and that their safety is not jeopardized.

8

Conclusions

In this chapter the conclusions on how the research questions of the thesis were answered and how the project objectives were achieved, are presented.

8.1 The first supportive research question

What do truck drivers need to be able to enjoy their leisure time in the cab?

The users' needs found in this thesis are based on 70 European long haul truck drivers who participated in the user research. Among the users' needs that were mostly related to their leisure time are: social contact, being able to enjoy their hobbies while they are on the road, being able to relax after their work day, disconnect from work (both physically and mentally), and time efficient tools to have more time for themselves.

In addition, it was also found that long haul truck drivers need to disconnect from work to be able to enjoy their free time, the activities they do, and to lower their stress. Activities such as: taking a shower, exercise, meeting people and changing environment are among the ones that helps them disconnect the most, based on two surveys where 26 European long haul truck drivers participated either at Sandsjöbacka (Sweden) truck stop, online or in a focus group session.

8.2 The second supportive research question

In which three ways can truck drivers' needs be fulfilled to improve their leisure time in the cab according to stakeholder's interest?

To be able to answer the main research question, it was decided to develop three concepts, and analyze and compare them, to present different solutions. The three concepts developed were focused on helping truck drivers to disconnect from work so they could enjoy their leisure time, and the concepts are: an exercise and adventure tool that encourages truck drivers to move and explore the surroundings of truck stops with gamification features; a communication tool that offers an immersive conversation experience where truck drivers can talk about any subject and feel

that they are in a different environment rather than in the truck cab; and lastly a suit that allows them to take either a shower or a bath in it.

These three concepts considered the stakeholder's requirements and tried to be innovative and yet feasible to implement. Each concept presents as their main feature an activity that helps truck drivers to disconnect. However, each of them needs to be further explored and developed to be able to evaluate if both the users and the main stakeholders (Volvo Trucks) appreciate them or have the interest to have them in the truck cabs, and the viability to implement them.

8.3 The main research question

What interactive product can improve truck driver's leisure time while they are in the truck cab?

The 'Buddies on the Road' concept is a digital application that provides options of activities that truck drivers can engage in during their leisure time. It has three main features in which all of them offer a number of activities, among the main ones: explore surroundings, exercise, changing environment and meeting people. All these activities help truck drivers to disconnect from work according to the online survey in which 16 truck drivers participated in, Figure 5.12.

The 'Explore' feature allows the drivers to change environment to be outside of the truck cab and explore the surroundings while doing some low level exercise (e.g. walking, hiking). It also offers the option of inviting people to go with them. The 'Challenge' feature allows drivers to exercise and keep in touch with both distant and close friends through challenging each other. At last, the 'Let's talk' feature allows truck drivers to meet people online, converse about a certain topic and invite friends to the conversation, offering a digital space where they can meet.

All these features have a social aspect, offering truck drivers the opportunity to build a network among them and interact with each others. Truck drivers can always see the people who are at the truck stops and see their closest friends nearby (in either a list or a map visualization), to encourage them to contact people or plan their routes according to where their friends are. It was found important to offer social interaction options (as mentioned in the user needs) due to the many international drivers who work in countries where they do not speak the native language nor international known languages (e.g. English), and therefore meeting people is challenging for them. This is what the 'Let's talk' feature tries to provide a solution to.

Moreover, 'Buddies on the Road' is an interactive tool that can improve truck drivers' leisure time by helping them to disconnect from work and meet people. However, further exploration should be made to refine the graphical interface, evaluate usability and test in the real context to know if their safety could be jeopardized (e.g. if use when driving).

8.4 Project objectives

The main goal of this thesis was to design an interactive product to improve truck driver's leisure time while they are in the truck cab. The final design addresses the main research question and other requirements that unfolded during the process. 'Buddies on the Road' is a concept of a tablet application where truck drivers can socialize with other truck drivers through different activities, such as exercise and see the surroundings; with this concept the research goals is considered achieved.

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A

Appendix

A.1 Contextual inquiry

Aim: Empathize with long haul driver lifestyle, challenges and needs in terms of entertainment.

Learning goals

- Perceive the driver behaviour when being on the cab during their free time
- Target different scenarios throughout the day, to use it as a base when interviewing other drivers in following user research.
- Observe and target challenges that might not be mentioned by the driver.
- Get a better understanding on how truck drivers enjoy their free time on the road with the resources available? and in how does that enjoyment differs with when being in another context?

Background of the driver

1. For how long have you been/were you a long haul driver?
2. How often do/did you stay overnight in the cab? and for how many days?
3. Do/did you find it challenging to sleep in the cab or be on the road for several days? Why? and How?
4. Do the trucks that you have driven differ from one another in terms of amenities (if they are from different brands)?
 - (a) Which are the amenities that you mostly appreciate to have? Why?
5. Have you work in another field before becoming a truck driver? Why did you decide to become a truck driver?

6. What major changes (in your life) have you had to make to adapt to the truck driver lifestyle?

Entertainment

1. How many breaks per day do you usually take when you are driving for several days? and how long are those breaks?
2. Do you usually have a routine or plan the day in advance regarding breaks during the day? If yes, do you also plan what you will do in those breaks?
3. Activities on the road:
 - (a) What do you do during breaks during the morning?
 - (b) What do you do during breaks during the afternoon?
 - (c) What do you do when having long breaks?
 - (d) What do you do when having short breaks?
 - (a) What activities do you enjoy to do on your free time? (e.g like weekends) Why?
4. What activities do you enjoy to do the most after a long day at work when you are close to home? Why?
5. Do you feel a need of doing something to entertain yourself when living on the road? Why?
 - (a) What do you usually end up doing?
 - (b) What would you like to be able to do?
6. Which amenities would you appreciate to have in the cab for killing time?
7. Do you rather enjoy your free time alone or with company? Why?
8. When enjoying your free time alone do you have any preference on what do you like to do?
9. Order the following categories from the one you value the most to the one you value the least:
 - (a) Being social.
 - (b) Games.
 - (c) Sports.
 - (d) Culture.
 - (e) Educational options.
 - (f) Technology.

- (g) Other?
10. Which of the following states do you value the most when you are alone:
- (a) Comfort
 - (b) Restful
 - (c) Stress less
 - (d) Motivated
 - (e) Energetic
 - (f) Other?
11. What do you relate entertainment with?
- (a) Can you express any feeling you relate with entertainment?
12. Is there a difference or preference on routes to drive in?
- (a) What kind of preference?
 - (b) Do you behave or do things differently depending on the route?

Cab

1. What's your definition of perfect working environment?
 - (a) What's your definition of perfect living environment?
2. Scenarios:

Imagine that the truck cab is 10 times bigger than it is currently and you have the option to request for facilities to be added and to personalize it yourself. The options are limitless and you don't have to think of price nor logistics.

 - Can you describe how would that cab looks like, what would it have, colors, materials, items, how does it behaves?

Imagine that in every stop you make during the day, when staying overnight on the road, you have a house nearby, your house, it belongs to you. You can park the truck and walk to your house, and stay there for the night.

 - What would you like to do during the free time when you are at that home? What would you like it to have in terms of entertainment?
3. Are the current challenges in terms of entertainment similar on how they were 10 years ago?

A.2 Interviews

Aim: Find out what kind of entertainment long haul truck drivers would appreciate to have in the cab, confirm how they entertain themselves today, and what needs do they have in terms of entertainment.

Learning goals

- Truck driver's definition of entertainment
- Truck driver's entertainment options today in the cab and what they miss the most about of entertainment options in other contexts.

Lifestyle and type of driver

1. Are you a long haul driver?
 - Nights/week?
2. Where are you from? (if not from Sweden)
3. Do you find it challenging to live in the cab or be on the road for several days? Why? and How?

Entertainment in the cab:

4. Can you describe a normal day for you as a long haul driver? How does it look like?
 - Morning / afternoon
 - Short / long breaks
 - Kill time?
5. Do you feel the need to do something to entertain yourself when living in the truck cab? Why?
 - What do you usually end up doing?
 - What would you like to be able to do?
6. When enjoying your free time alone at home, what activities do you enjoy doing?
7. Do you rather enjoy your free time alone or with company? Why? Does it matter with who?

8. Scenarios:

Imagine that the truck cab is 10 times bigger than it currently is and you have the option to request for facilities to be added and to personalize it yourself. The options are limitless and you don't have to think of price nor logistics.

- Can you describe how would that cab looks like, what would it have, colors, materials, items, how does it behaves?
- Which amenities would you appreciate to have for entertainment?

Imagine that in every stop you made during the day, when staying overnight on the road, you have a house nearby, your house, it belongs to you. So you can park the truck and walk to your house, and stay there for the night.

- What would you like to do during the free time when you are at that home?
- What would you like it to have in terms of entertainment?

9. Which activities do you enjoy to do the most on your free time at home? (e.g weekends) Why?

- Exercise
- Be with people
- Relax
- A special hobby (Which one?)
- Other (what?)

10. Pick 3 options that you value the most: -Why?

- Being social.
- Games (e.g. sport games, board games, video games, etc)
- Exercise.
- Media entertainment (e.g. shows, movies, so on)
- Educational options.
- Technology.
- Other?

11. Pick 1 state that you value the most when you are alone: -Why?

- Comfort
- Restful / Stressless
- Thrilled / happy
- Energized
- Other?

A.3 Focus group

Aim: Find needs, problems, issues while they are in their leisure in the cab and are not driving

Learning Goals

- Understand truck drivers behaviours and motivation behind the actions they performed when they are on their breaks inside the cab.
- Understand truck drivers meaning (mental model) of “leisure” and “entertainment”.

Agenda

1. Introduce purpose and rules of the workshop. Mention how important their knowledge and contribution can be for the design of future truck cabs. (Duration: 5 min)
2. Icebreaker (Duration: 5 min)
 - Introduce yourselves by saying: name, how long you have been a truck driver, how does your working/sleeping in the cab schedule looks like, family situation and your favorite hobbies?
3. **Word Association:** Write on post-its all the words you associate with “leisure” and place them in the A2 paper in front of you. (Duration: 5 min)
4. **Discuss** activities you do during your breaks and how long time they take. (Duration: 30 min)
 - Is there something you only do in short/long breaks? What? Why?
 - How much time do you have for breaks?
 - Where do you usually sit during those breaks? Why do you sit there?
 - Where do you place stuff when eating? How is the setup? Why is it like that?
 - During your relaxing time, where do you sit? What do you do or use? Why? (if watching a movie, where do you place your computer?)
 - During leisure, when not working, would you like or want to talk to people?
 - Do you usually have a hard time to fall asleep? What do you do about it?
5. **Word Association:** Write on post-its all the words you associate with “entertainment” and place them in the A2 paper in front of you. (Duration: 5 min)

6. Scenario-based (Duration: 15 min)

You are in an ongoing work trip with the truck for several days, after a couple of days your phone, tablet and computer stop working. There are still several days to be on the road before going home

- What would you do? How would you solve this and is this a big problem for you?
- How would you manage to communicate with your family, friends and work?
- How would you manage to entertain yourself?
- How does it feel to not have these devices available in the truck?

Imagine that you have arrived to the place you are going to retrieve the cargo. When you check in and announce your arrival, it turns out that the load is not available and won't be for a couple of hours. Therefore you will have to wait in order to upload the cargo and get going.

- What would you do then during that time?
- Would you rather have more time available during these breaks or rather to start driving/working and finish earlier?

A.4 Fill in the blanks.

Would you like to share your experience as a long haul driver?

You start a regular long haul truck driving trip. You are working (in average) _____ hours per day and after parking the truck, the first thing you do is _____. You are longing to _____ during your free time and you hope that you are able to do it soon.

One day when you have been driving for a couple of hours you decide to take a break for 30 minutes. The first things you do is _____ and after you _____. The rest of the break you spend it by _____. One thing you always think of in the breaks is _____.

Next day, after working for only 6 hours, you find out that you are done for the day and can't continue until the next morning. When you arrive to your destination at the foreign place (far away from home), the company who is in charge of handing in your new load tells you that the load won't be ready until the next morning. It looks like your day ended up being a _____ one and you feel _____ because _____. Now that you have so much time to spare during the day, you will spend it by doing: _____, _____ and _____. But when the night comes you rather spend the time doing: _____, _____ and _____. The best thing that ever happened to you while being in the cab was when _____, while the worst day you can remembered was when _____.

A word that you relate with leisure is _____ and entertainment gives you the feeling of _____.

Thank you very much for taking the time for filling this form! One last thing, what country do you live in? _____

A.5 Evaluating Concepts

Aim: Confirm that the three concepts address the design challenge and are appreciated by long haul truck drivers.

Adventure / Exercise

Learning goals

- Does it motivate them to go outside or to exercise/adventure inside?
- What motivates them to use it? What features should be kept/improve?

Task: Introduce the concept and the users should try to increase their score!

Questions

1. What do you think about this idea?
2. When do you see yourself using it? (e.g. during your breaks)
3. Does this tool encourage you to exercise more? What part of the idea motivates you to use it? (e.g. the score, the adventure, your friends, etc)
4. What features are important for you from this product (choose **2** of them):
 - ☐ Compete
 - ☐ Exercise
 - ☐ Health
 - ☐ Explore the surroundings
5. What features would you appreciate the most to add?
 - ☐ Making friends
 - ☐ Communicate
 - ☐ Challenge others
 - ☐ Team competition
 - ☐ Gain points for eating healthy
 - ☐ Other: _____

Sharing your day

Learning goals

- Do they feel the need to **talk** to someone?
- Is it important to see the real people or to be in another environment with them?

Task: Introduce the concept with paper prototype

Questions

1. Do you think about this idea?
2. Would you want to talk with other people who understand your lifestyle?
3. When do you see yourself using it? (e.g. during your breaks)
4. Is it valuable to choose the channel/topic?
 - (a) And is it valuable to see the environment?
 - (b) Is it valuable to see the people you are talking with?
5. Would you use it? For what purpose?
6. What features are important for you from this product (choose **2** of them):
 - ☐ Communicate with anyone
 - ☐ Make friends
 - ☐ Change environment
 - ☐ See other people
 - ☐ Sharing your day/experience
 - ☐ Talk about similar interests
7. What features would you appreciate the most to add?
 - ☐ Doing activities together
 - ☐ Save contact information
 - ☐ Invite people to talk
 - ☐ Create friends/family channels
 - ☐ Schedule meetings
 - ☐ Other: _____

Cleaning Suit

Learning goals

- Would they like to take a bath or a shower in the suit?
- What features are appreciated ? E.g. sitting/ standing or soap/ only water.
- Confirm that this idea help truck drivers to disconnect/lower stress?

Introduction:

It is a suit that you put on and it gets filled with warm water. After you are done using it, you can drain the water to the tank. You can add soap and the water gets filtered, so you can reuse it several times.

Questions

1. What do you think about this idea?
2. Do you think using this suit will help you disconnect from work?
3. When do you see yourself using it? And how would you use it? (e.g. outside/inside the cab, sitting/standing)
4. Would you use it? For what purpose?
5. What features are important for you from this product (choose **2** of them):
 - ☐ Refresh yourself
 - ☐ Get clean
 - ☐ Warm your body
 - ☐ Relax with the water
6. What features would you appreciate to add?
 - ☐ Sounds
 - ☐ Massage
 - ☐ Wash the hair
 - ☐ Communicate with others
 - ☐ Other: _____

A.6 Online survey

Hello long haul truck drivers

We are design students working on how can we help you (truck drivers) to disconnect from work and lower stress during your breaks, when you are still in the cab.

We have designed three concepts that could be implemented in future trucks, but to choose one of them, we want to confirm which activities helps you or can help you to disconnect from work.

Activities that helps you or could help you disconnect from work?

	Rarely	Sometimes	Sometimes	All the time
Exercise	☐	☐	☐	☐
Talk about your day	☐	☐	☐	☐
Taking a shower	☐	☐	☐	☐
Meet with people	☐	☐	☐	☐
Explore nature or surroundings	☐	☐	☐	☐
Bath with warm water	☐	☐	☐	☐
Change environment (different place)	☐	☐	☐	☐

A.7 Proof of Concept

Aim

Test the concept in its early stages to know what makes sense to have in the final design and what should be improved or consider when developing further

Learning goals

- Does it encourage users to interact with it?
 - What parts/features from the application motivates them?
- When would they use it?
- Does the application help to disconnect from work?
- Does the structure and navigation make sense?
- Does the content displayed make sense to have?
 - Is there lack or abundance of information?
- What other uses they would appreciate from this app? (e.g planning stops, finding new friends)
- Is an aging/growing avatar motivating?
- Is it motivating to compare the amount of exercising to another kind of exercise?

Pitch

This is a tool to disconnect from work by exploring new places, socializing and competing against others.

Scenarios

Imagine that all the new trucks have a tablet incorporated inside the cab that you can interact with. It has several applications installed, such as music player, games and even work related apps.

One day at work, you decide to take a lunch break of 45 minutes. After finishing eating you grab the tablet and open the ICollect app to see if there is anyone connected who are talking about last night football match. You head to the hangout tab and see the different groups you have saved in the app and you search for the football channel. Your friends Joseph and Charlie are there (as you imagined they would be) and they are bragging about how their team won. The conversation goes quite pleasing as Malin and James (strangers to you) bring interesting thoughts on how the game unfolded. After you share your opinions with them, you decide to close the app and get back to the road, but before starting to drive you add these two people to your contacts, to continue the discussion in another time.

The day goes by and after finishing the working day and park in a new truck stop that you haven't done before, you open the ICollect application again to see what

places and people are nearby from where you are. Once you open it you immediately see there are several places to check out (not so far away from where you are). As there is still light outside, you decide to check out the Old tree which is only 1 km away. Before heading there you decide to invite some people who are in the same truck stop than you, to join you for the walk. When you get back you check again the app to see how many flags you have collected and you noticed that one old friend of yours just stopped in a truck stop close to yours. You call him and tell him where you are so he can join you if he'd like.

After finishing dinner with your friend, you open the ICollect app once again to see how you are doing in comparison with your friends regarding the number of hearts you have. You have some energy left and want to gain points to have a better score than Jimmy (your friend), therefore you choose to do some pushups but the easy level, as it is getting late. When you are done you decide to challenge your colleagues Joseph and Mats who haven't been that active lately.

The next day, tommy has 15 minutes left of his lunch break then he finished eating. He just ate the same lunch as always and feel motivated to get some inspiration of new dishes that is possible to cook in the cab. He once again opens the "Buddies on the road" app and goes to "Let's hang out"

Interview Questions

1. Would you like to try it? Would you like to have the app in your cab?
 - What would make you use it?
2. Do you see yourself using it? For what exactly? why?
3. What do you think about the "Collecting Flags" features"?
 - Can you see some things that need to be improved in this feature? What?
 - What is missing in this feature to be awesome?
4. What do you think about the "Collecting Hearts" features"?
 - Can you see some things that need to be improved in this feature? What?
 - What is missing in this feature to be awesome?
5. What do you think about the "Collecting Flags features"?
 - Can you see some things that need to be improved in this feature? What?
 - What is missing in this feature to be awesome?
6. How would you describe this application and its purpose (to a colleague) in a few sentences?

A.8 Testing Digital Prototype

Aim

Test the concept in its early stages to know what makes sense to have in the final design and what should be improved or consider when developing further

Learning goals

- Learn and understand flaws of the design.
- Find out what needs to be improved in terms of navigation and content.
- Thoughts or recommendation on future improvements.
- Room for scalability or use in other contexts?

Learning goals

We are presenting a tool designed for long haul truck drivers to be used during their breaks. The test consist of performing tasks instructed by us, and you should think out loud when doing those tasks. Feel free to express any thoughts, concerns, frustrations or opinions that comes to your mind!

Task

1. Explore:

- Check the “Pipe structure” and invite three people to go with you.
- Recommend the site by choosing what do you think of the experience and share it with 3 friends of yours.

2. Exercise:

- Accept the push-up challenge
- Challenge Fredrik and Lisa with the same exercise to but with a medium level.

3. Hangout:

- Hang out with people by talking about food
- Create a “Let’s Talk” group where you can talk about bicycling and invite some friends to the group.

Questions:

Before explaining the actual purpose of the application:

- What do you think this application is for? Or why has it been designed?

- Did you miss anything in the app?
 - Was the information displayed in each view enough for you to perform the task? What was missing?

After explaining the actual purpose of the application:

- What do you think can be added or removed to have a better experience when using this application? Any feedback overall?
- Can you mention what doesn't make sense for you?