

Activity Organizing Service PAUSE.

Researching social breaks and vital activities for truck drivers at rest places.

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ABSTRACT

Breaks are essential to maintain the physical and mental well-being of Dutch domestic truck drivers. However, resting places do not facilitate nor promote vital activities for truckers. This project aims to research if an activity organizing service can connect truck drivers to be more vital during their break.

During the process, contextual semi-structured interviews with truck drivers were conducted. Surveys were completed by stakeholders of which a stakeholder map was made, to see their influence and interest. A final A/B user test has been done with drivers. After gathering and analyzing the data retrieved from this research, 'PAUSE.' was created.

PAUSE. is a research concept for an activity organizing platform. The app allows truck drivers to meet up for activities at resting places and spend their break together. An in-car physical extension of the app assists truckers in joining a social break.

Keywords

Social interaction, Truck drivers, Breaks, Resting places, Vital activities, Connecting platform



Pause: Experience the social side of your break

INTRODUCTION

The transportation sector plays a crucial role in the Dutch economy. Within this sector, land transport makes up the majority of earned gross domestic product (39.3% in 2020) [54]. However, workers in this branch, being mostly truck drivers, live among the unhealthiest lifestyles of all sectors [18].

People working in the land transportation sector, hereafter transportation sector, often lack physical activity [18], are overweight [3, 26] do dangerous work [8] and there are relatively high absenteeism rates in this sector [7, 9, 17, 19]. Furthermore, the workload for truck drivers has increased much over the last years [15], they make long days, have not much autonomy [6] and experience high stress levels [5, 55]. On top of that, facilities on the truck parking spots are lacking and there is a large shortage in truck drivers [41, 48].

Breaks are one of the few moments where truckers have the ability to practice revitalizing activities, such as social-physical activities and relaxing experiences. These recovery moments are not only important for physical and psychosocial well-being, but also for safety reasons [1, 22]. However, truckers experience problems taking a break because of the pressure around the exact length of breaks, and the uninviting nature of resting places.

Improving the conditions and pastime of breaks would lead to a more positive mood and better health conditions for truck drivers [13]. This is in the interest of truck drivers themselves, but also fits the needs of their employers (transportation companies), the union (FNV), and the Dutch Ministry of Infrastructure and Water Management (Rijkswaterstaat).

For the transportation companies, vital employees will result in improved job performance [13]. In turn, this will most likely reduce absenteeism rates and lowers the risk of causing accidents, which correlates with higher profit margins [27]. The FNV represents the interests of truck drivers, therefore increased work enjoyment and healthier work environment is in their favor. Lastly, Rijkswaterstaat is an important player, being responsible for the roads and rest places utilized by the truck drivers [25]. Therefore, especially safety is an important factor for them.

Since the profession lacks breaks that promote social interaction and activities for improved mental and/

or physical wellbeing, the problem was addressed by developing a basic version of an activity organizing and connecting service. Both truck drivers, as well as other stakeholders were consulted to find the feasibility, need, and realization for such a service. Therefore, the leading question for this research states:

"Can an activity-organizing service connect working truck drivers in order to encourage them to do vital activities at rest places during their break?"

By researching this topic, the foundation can be laid for a way to improve physical and mental wellbeing of truckers, increasing safety on the road and enjoyment in the job. This could improve the image of the profession, resulting in influx of new truck drivers and all together a better functioning transportation sector.

RELATED WORKS AND BENCHMARK

TRUCK DRIVERS

Current situation

The Dutch transportation sector is mainly employed by people with a low social-economic status (hereafter SES), mostly older men. Although income is low, truck drivers often experience a high sensorineural and mental load from the job [49], with overworking bringing sometimes even more stress [5].

The Netherlands counts approximately 90,000 professional truck drivers of which the majority is overweight (44%) or (severely) obese (22%, compared to 14% of the overall workforce). Only 19% meets the standards for physical activity, and few reach their daily recommended intake of fruits (15%) and/or vegetables (8%) [3, 55].

The work pressure and stress, together with the physically intense labor and repetitive nature of the job causes the most absenteeism [55]. Furthermore, drivers having higher BMI, can also be related to the relatively high rates of absenteeism within the sector (4.2%) [17, 19, 55]. It can therefore be concluded that Dutch truck drivers generally live an unhealthy lifestyle,

subsequently resulting in absenteeism.

Importance

Mental and physical functioning influences people's driving ability [1, 22]. Improving truck drivers' physical and mental state will therefore bring more traffic safety, since most truck accidents happen because of human failure [27].

Furthermore, the number of truck drivers has been declining, and influx of young people keeps lagging behind [32]. In the near future, the expectations of shortage in truckers, accompanied with even busier schedules, will create longer sedentary times and more pressure on truckers [15]. This emphasizes the importance of a healthy lifestyle and good well-being for truckers in order to do their jobs safely and with pleasure, improving also the image of the profession.

VITALITY

Definition

In literature different definitions of vitality can be found:

- Stern [42] explained how George Klein defined vitality in 1967 as "personal feelings of pleasure in experiencing the self as an effective agent of change (which) resides in the perception that through one's interference one has changed and can change the course of events once set in motion";
- The Oxford Dictionary [30] defines vitality as the state of being strong and active; and having the energy or the power giving continuance of life, which is present in all living things;
- According to Schaufeli and Bakker [40] vitality stands for "being energetic, resilient, fit and able to work relentlessly with great perseverance";
- Richard M. Ryan explains subjective vitality as one's conscious experience of possessing energy and aliveness, also described as someone's overall well-being. Ryan & Frederick [36] explain that this subjective vitality, is hypothesized to be reflected by physical and psychosocial factors.

Based on these sources a definition of vital activities for this research was defined as: activities that maintain or improve physical and/or mental well-being. A vital activity does not necessarily require great cognitive effort, but the activity should feel energizing towards the body and/or mind and create a feeling of aliveness. This definition has been reviewed and partly informed by Prof. Dr. Annet de Lange with expertise in this area.

Social interaction

Taking social factors as an important part of vitality makes sense, as social needs and feelings of belongingness are important to humans [23]. Moreover, getting this social contact is important for maintaining good health [38], and reducing stress [29].

According to McLeod [23], this need for interpersonal relationships also drives behavior. Similarly, Stanford research showed that a feeling of working on problems and tasks all together, can inspire motivation [31]. As truck driving is quite a solitary job, opportunities can be found in researching the possibilities of social interaction for the overall well-being of truck drivers. This creates room to utilize social interaction as encouragement to do vital activities. Facilitating these activities during trucker's breaks could result in an increased positive mood and vigor, job performance, and a decreased disengagement [13].

BREAKS

Breaks being essential to maintain a high degree of concentration that is required to safely drive a truck [15]. Furthermore, adequate recovery from work activities, being proper breaks, relates with increased employee well-being, performance capacity, and performance-related outcomes at work. Fritz [13] analyzed the relation between work-break activities and experiences of employee outcomes (figure 1). Unfortunately, two main factors create and maintain a threshold for truckers in taking proper breaks: regulations on resting times, and resting places.

Regulation on resting times

Dutch truckers are obliged to take a break, of in total 45 minutes, after driving for a maximum of 4,5 hours.

Activities and Experiences	Health, Well-being, and Performance Outcomes
<i>Relaxing experiences</i> (taking a walk or reading a book)	<ul style="list-style-type: none"> • Increased positive mood and vigor • Decreased negative mood and exhaustion
<i>Mastery or growth opportunities</i> (learning something new)	<ul style="list-style-type: none"> • Increased positive mood and sense of vitality • Decreased fatigue
<i>Psychological detachment from work</i> (mentally and physically distancing oneself from work)	<ul style="list-style-type: none"> • Increased positive mood and life satisfaction • Decreased burnout • Highest levels of task performance and proactive behavior at medium levels of detachment
<i>Social activities</i> (spending time with friends or family)	<ul style="list-style-type: none"> • Increased positive mood, vigor, and overall well-being • Decreased disengagement • Increased job performance
<i>Physical activities</i> (exercise or outdoor activities)	<ul style="list-style-type: none"> • Increased positive mood and vigor
<i>Sleep and napping</i>	<ul style="list-style-type: none"> • Decreased fatigue • Increased work motivation • Increased task performance
<i>Work-related activities</i> (spending time working during the work break)	<ul style="list-style-type: none"> • Decreased well-being • Decreased sleep quality • Increased negative mood
<i>Reflecting on work</i> (thinking about the negative or positive aspects of work during time off)	<ul style="list-style-type: none"> • Negative work reflection • Increased health complaints and exhaustion • Positive work reflection • Decreased burnout • Increased proactive behaviors, creativity, helping behaviors, and pursuit for learning behaviors

Figure 1: Relationships Between Work-break Activities/Experiences and Employee Outcomes. [13]

Fees for violating this rule can range from 100 to 1950 euros [47]. Unfortunately, truck drivers experience this law as a burden. Not only does this regulation not facilitate enough time for a healthy lifestyle during work, but also creates contradictory orders, as fees should be avoided but delivering norms should be met [24, 44]. Truckers report that complying with the regulations and the contradicting orders leads to more performance pressure and less enjoyment of breaks.

Rest places

It can be found that Dutch resting places lack in nature, are badly maintained and lack in hygienic, nutritional, security facilities [2, 3, 5, 16]. That is even while, according to Rijkswaterstaat [37], rest places should be road safe, socially safe, complete and clean.

Therefore, it is understandable that most rest stops, also do not facilitate sufficient recreational use for truckers (e.g. physical or social activities, and relaxing experiences). However, there would be room for certain interventions in the so called 'residence area' (figure 2). Here, basic and additional facilities can be positioned, provided that the law is obeyed, considering i.a. overview, transparency and light [37].

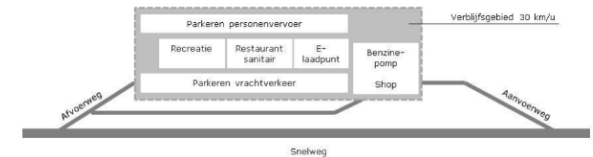


Figure 2: Overview of facilities rest place. [37]

As these resting places are usually financed by the government, and not the direct beneficiaries at the location itself (e.g. service stations) there is a lack in interest and budget to develop better resting places. Making both service stations, as well as Rijkswaterstaat interesting stakeholders. In conclusion, the empirically unexplored nature of highway resting places accompanied by the lack of facilities for improved breaks for truckers make this a potent research area.

BENCHMARK

Truckers' health intervention

Research into current interventions showed that they typically are persuasive brochures showing the risks or benefits of (un)healthy behavior [3]. The researchers argued that these are unsuccessful because they do not appeal to the volitional phase of health improving behavior, entailing more concrete action plans. Practical steps are better understandable for people with a typically low SES.

Existing platforms

Truck drivers are already using different platforms to plan their breaks, or connect with colleagues. The platforms Truckfly [46], Zenly [14, 56] and Whatsapp [53] were found to be used and therefore researched for this benchmark. The results can be seen in the visual below (Figure 3).

The existence of these platforms shows that there is a need to connect with others and rest places, whereas the use of mobile apps is regular.

Upgrading rest places

With regards to the optimization of resting places, a conceptual Dutch project 'Verzorgingsplaatsen 2.0

InnovA58' can be looked at as an example [51]. The ambitious concept was speculating a transition towards 'transport hubs' instead of individual resting places, putting more focus on recreation and health by adding sporting facilities, better nutritional cantinas, and recreational areas.

Although both passenger and transport traffic are enthusiastic, the concessionaires and potential exploiters are sceptic [51]. This means that future optimizations of resting places could be successful, provided that the implementations should be very clear in the value proposition for the financiers of resting places.

RESEARCH QUESTION

To summarize, truck drivers are both mentally and

physically not in the best circumstances, therefore it can be valuable to intervene during their break at rest places. Research showed the importance of social interaction and the possibility of combining this with encouraging vital activities. Furthermore, different platforms are already used, portraying an example of how to promote this social connection during their breaks. Therefore, this project aims to answer the following research question:

"Can an activity-organizing service connect working truck drivers in order to encourage them to do vital activities at resting places during their break?"

Research potential

Ultimately, this study could result in adding to the underexplored database on vitality among truckers, which would benefit researchers. Secondly, a conceptual or newly developed intervention (both on-site facility and a digital platform) at resting places could pave way for impactful interventions for healthier truckers. Targeted appropriately could benefit transportation companies, unions, government, and concessionaires of resting places.

DESIGN PROCESS

Target Group

First, we had to determine our target group. Literature review was done into a variety of job sectors and their shortcomings of certain aspects indicating the mental and physical. The indicators that have been used are sedentary time, amount of overweight and obesity, absenteeism figures, psychological load, workload and danger at work. The most important insights were that people working in the transportation sector often struggle in all these categories. Therefore, it was decided to focus on truck drivers.

To empathize with our target group, we went to the rest place Meelakkers to perform contextual inquiry and qualitative observations (figure 4). The main insight was that truck drivers live an unhealthy lifestyle, physically as well as mentally. Also, the rest place is not a nice place to be at. Everyone stayed in their cabin and waited for the break to be over. We also noticed little interest in physical health during work, but more social and mental health. We concluded that we needed to focus on connecting truck drivers. This is the



Figure 3: Exploration of different connecting platforms used by truck drivers.

first step for them to start doing vital activities.



Figure 4: At rest place Meelakkers to perform contextual inquiry and qualitative observations.

Approaching the Problem

To connect truck drivers, we needed to find a way for them to show their openness for interaction. There are three moments that this can be done: Before the truck drivers enter the rest place, the moment when enter the rest place, and when they are parked at the stop.

Out of the contextual inquiry at Meelakkers rest place, it was clear that it is hard for them to plan breaks and that an attractive facilitation on location is necessary for them to get out of their cabin. Also, the threshold should be low, and everything needs to be simple and easy to understand.

We concluded to focus on stimulating truck drivers to take a social break before entering the resting place. Here the threshold is lowest, and it gives them clear information about what will happen.

Solution Exploration

We researched three big parts to find a solution to our problem: How to facilitate which vital activities, if it will work in context, and if a digital platform would work.

Which activities?

From the interviews at rest place Meelakkers, we did an analysis of activity preferences. From this, four activity categories were determined: High-intensity exercises, low-intensity exercises, cognitive challenges, social-emotional activities (see figure 5).

To get more specific ideas to implement which kind of activities, we built a scale model of a rest place to do co-creation sessions (see figure 6). Here truck drivers could show and explain what they like regarding activities, and what they think is possible at a rest place. We prepared a co-creation session with a transportation company to test this. Unfortunately, when we arrived, they had to cancel because of their busy schedule.

To still do a co-creation we found a method to do it online. It is called 'repertory grid'. The Repertory Grid Technique is a highly structured interview that elicits

people's constructs without influencing them by the researcher's preconceived questions. (Appendix 1). We prepared the repertory grid in Miro and contacted truck drivers via Facebook to participate. This could be done in their own time to avoid the problem of them being busy during working hours. Five participants were gathered to work on the grid. Again, unfortunately in the end nothing was fully completed. The co-creation research on preferred activities is inconclusive. The main take away from this is that truck drivers are very busy and need low threshold in order to do something voluntarily.

So, in order to define what vital activities would look like, we did literary research and created our own definition. This definition has been reviewed and partly informed by a Prof. Dr. with expertise in this area (Annet de Lange, personal communication, June 8, 2022). She explained it as "nicely summarized". From this we



Figure 5: Four categories determined for vital activities.



Figure 6: Scale model of a rest place used as demonstrator and discussion starter.

ended with a final definition for vital activities.

Will it work in context?

To understand the real-life situation, we contacted several stakeholders. This gave us a realistic view on the situation from all sides. We prepared an interview with Rijkswaterstaat, FNV union, transportation companies, and service stations. They were all very interested, but it was not possible to do interviews. For this reason, we sent them self-administered online surveys which were used to gather qualitative data. By using the power interest matrix tool to analyze the answers, we got to know each stakeholder's interests and influence. (See appendix 2).

Can a Digital platform work?

A simple mock-up app was designed to be used as an interview and test artefact (see figure 7). We went to Truck stop 8 to do contextual semi-structured interviews with truck drivers to ask about their thoughts on the platform. There were lots of positive reactions and it could work realistically if it is well thought out. It should not be again another app.

After this in-depth user research, we made a prototype to do our final user tests.

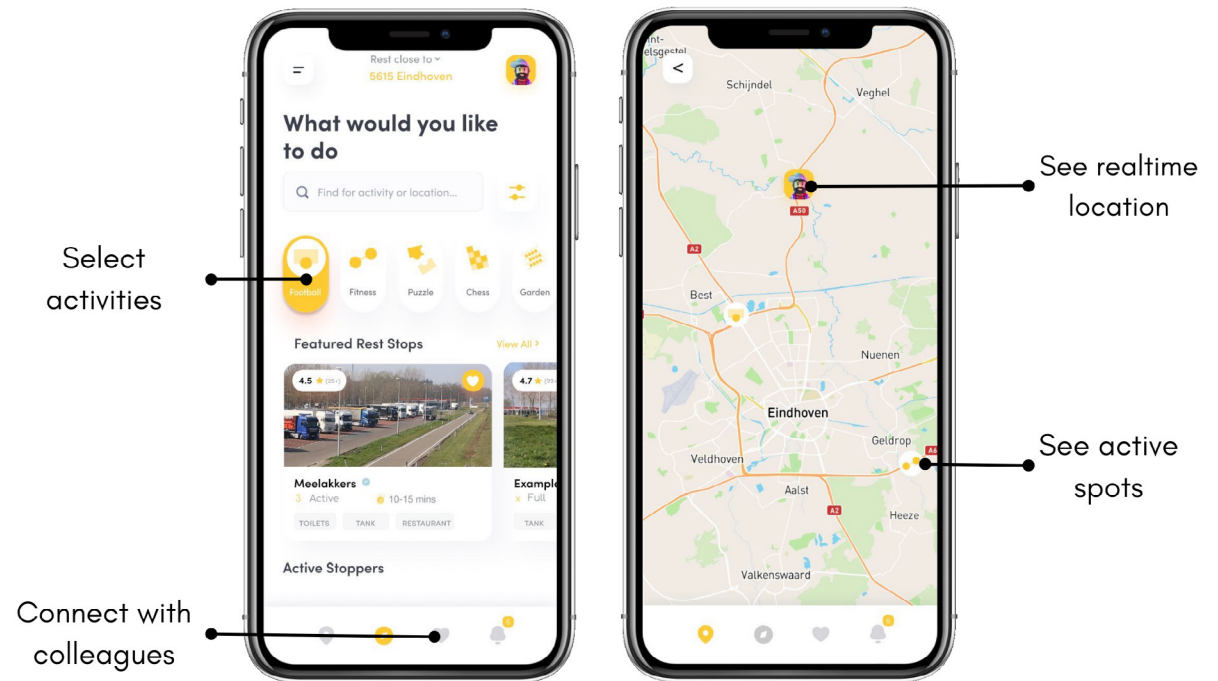


Figure 7: Explanation of mock-up app test artefact

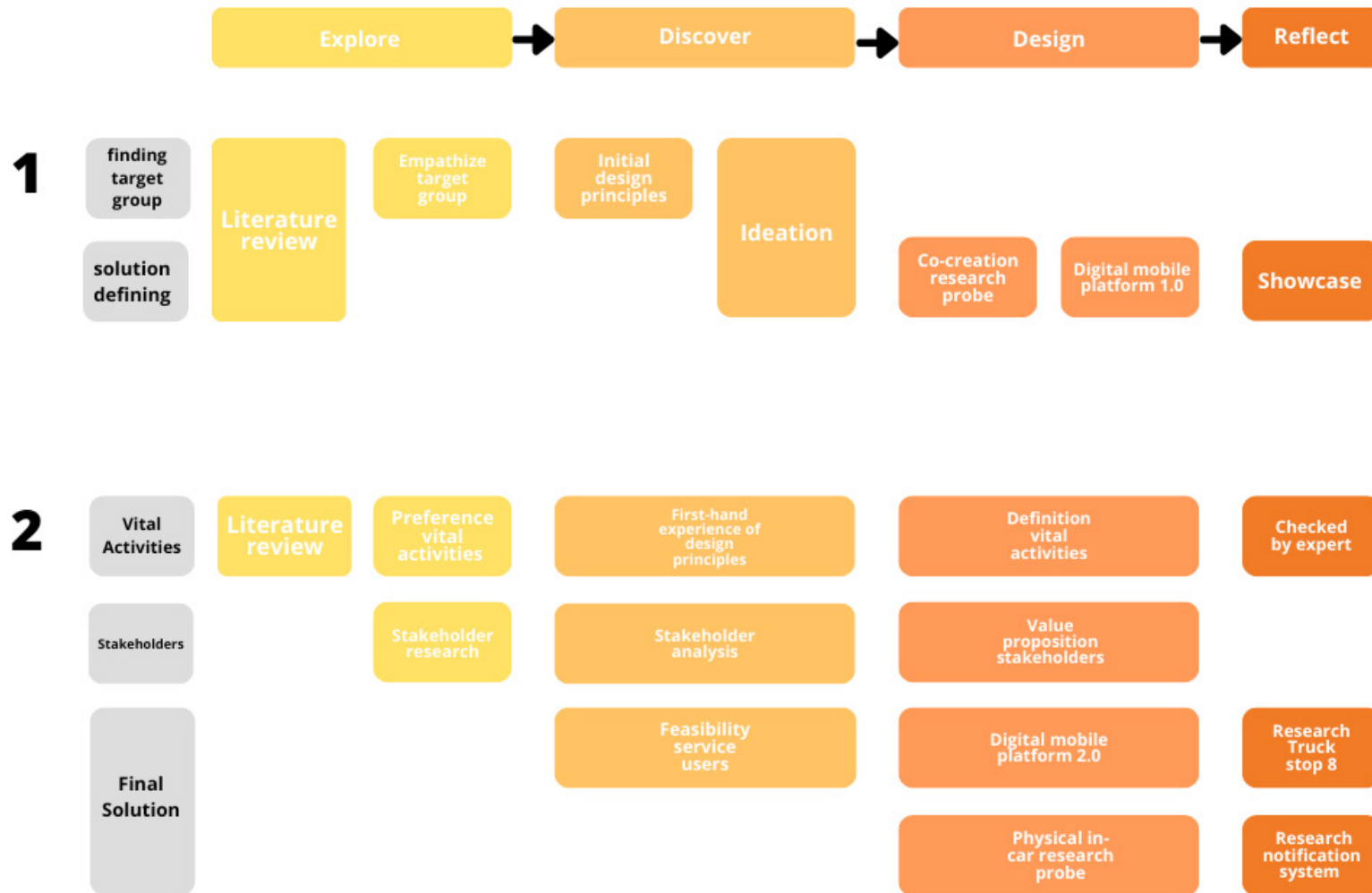


Figure 8: Visual design process

PAUSE.

Design of PAUSE.

The concept of PAUSE. is a digital platform with a physical extension to connect truck drivers and let them do vital activities during their break. The combination of a simple app with the physical test probe inside the truck gives truck drivers the chance to decide when, where and with whom to take a break while on the road (figures 9-11)

With the research probes, multiple user tests have been conducted to answer the following question: Can an activity organizing service connect working truck drivers in order to encourage them to do vital activities at truck stops during their break?

Underlying Design Principles

The aesthetic experience is of high importance to clearly show/stimulate the interaction with the design. The interaction between the user and the platform needs to emit the right energy to make truck drivers want to use it. Truck drivers indicated that they only want to use an app that is easy to understand and use, therefore it should be simple, easily accessible, and low threshold.

To also maintain traffic safety, the physical in-car app extension shouldn't be too distracting and require minimum usability effort. Therefore, the device is made as an extension of the dashboard, so it does not differ from regular usage in the vehicle. It has two buttons with 'YES' or 'NO' facilitate easy decision making, while the light from the LED's have been diffused and programmed to not be too obtrusive while driving.

When looking at the overarching principles that guided the design of the concept, five principles were defined. The ideal design intervention should be: social, vital, supportive, usable, and customizable.

- **Social:** User is open/stimulated to social interaction during breaks, because the job is quite solitary. Therefore, the design intervention should create social interaction.
- **Vital:** User wants/needs to live healthier, because they experience the downsides of living unhealthy. Therefore, the design intervention should stimulate physical and psychosocial well-being [36].
- **Supportive:** User wants to overcome barriers during work, because it allows them to live healthier. Therefore, the design intervention should make it easier to overcome those barriers [4].
- **Usability:** User does not want to put too much effort into using the design intervention, because they prefer simple interaction. Therefore, the design intervention should be of low threshold and easy to use.

Two main trade-offs were made during the process: Digital vs. Tangible design and Verbal vs. Tactile interaction.

Is the app as digital platform enough to stimulate truck drivers to take a social break, or is a physical device necessary to make it most effective? Only a digital platform (phone) might be dangerous to use while driving. It should not distract the driver from taking his eyes off the road. Also, a physical extension makes the driver more aware in decision making.

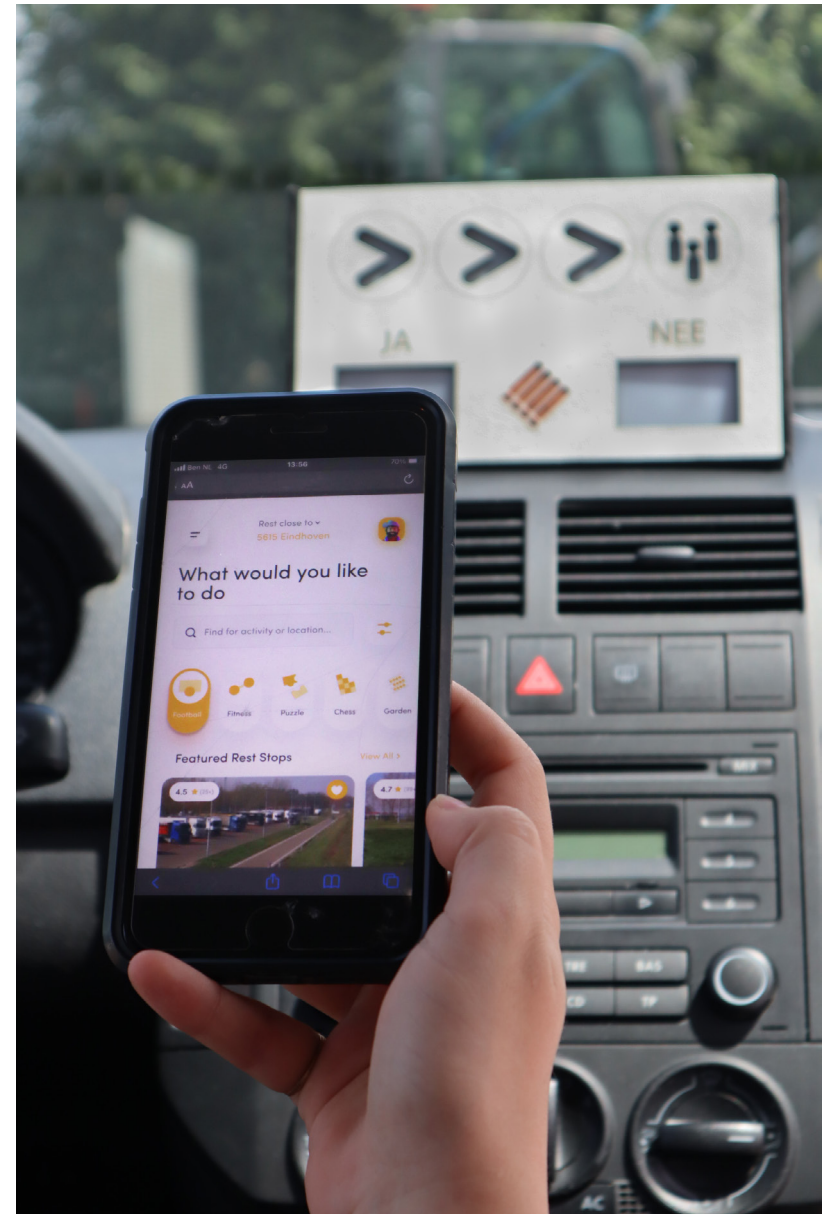


Figure 9: Test probe PAUSE. digital platform

And connecting to this: while driving, is verbal via the app, or tactile via the physical device preferred? For the physical extension we chose to use tactile interaction and visual guidance. These are clear and simple interactions that are safest while driving. We also considered interactions with smell, vibration and temperature, but these were not ideal in the context and could risk drivers' safety.

Technology and Realization

Figma allowed us to make a minimum viable product; using the least amount of effort for the most value. It was used to give the user the experience of a working online platform. In the mock-up app a map shows different rest stops and social hotspots. It also gives users the option to plan and choose where, when and with whom they want to do a certain vital activity.

The physical extension is built to test whether it gives drivers a more stimulating and effective experience. The demonstrator is a prism shape made of 3 mm thick MDF covered with black fabric and white paint to fit in well with the car interior. Its dimensions are (L x W x H) 21 cm x 15 cm x 11 cm. Inside an Arduino Uno connects two DFRobot Gravity LED Button Modules to a WS2812B Digital 5050 RGB LED Strip. This realizes the interaction between the user and the device. A Grixx power bank was plugged into the Arduino Uno as power supply (Figure 12). See Arduino code in appendix 3.

The technical challenges we faced are:

- The housing was too small for a strong enough power supply, so the power supply was left outside the device. A small hole in the back was made for a cable to connect the power supply to the Arduino Uno.
- Activating the physical prototype at the right moment. We tested using the Wizard of Oz technique, so we needed to press the button at the right moment.
- Car users cannot use a horizontal or vertical device while driving. For this reason, we had to make the display at a certain angle so that it was safe to use.
- Also, we were not able to build the physical device into the dashboard of the car. The device needed to be fixed onto the dashboard to make sure it would stay in the same place to prevent accidents.

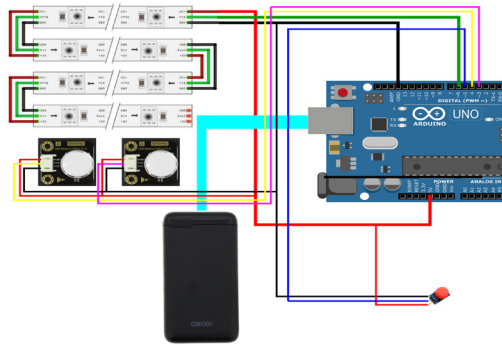


Figure 12: Schematic working physical extension PAUSE.

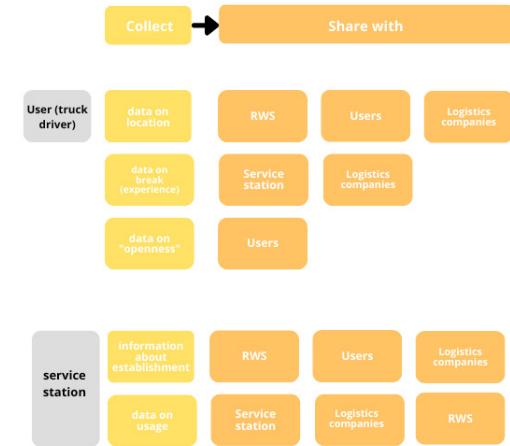


Figure 11: Overview of collected and shared data

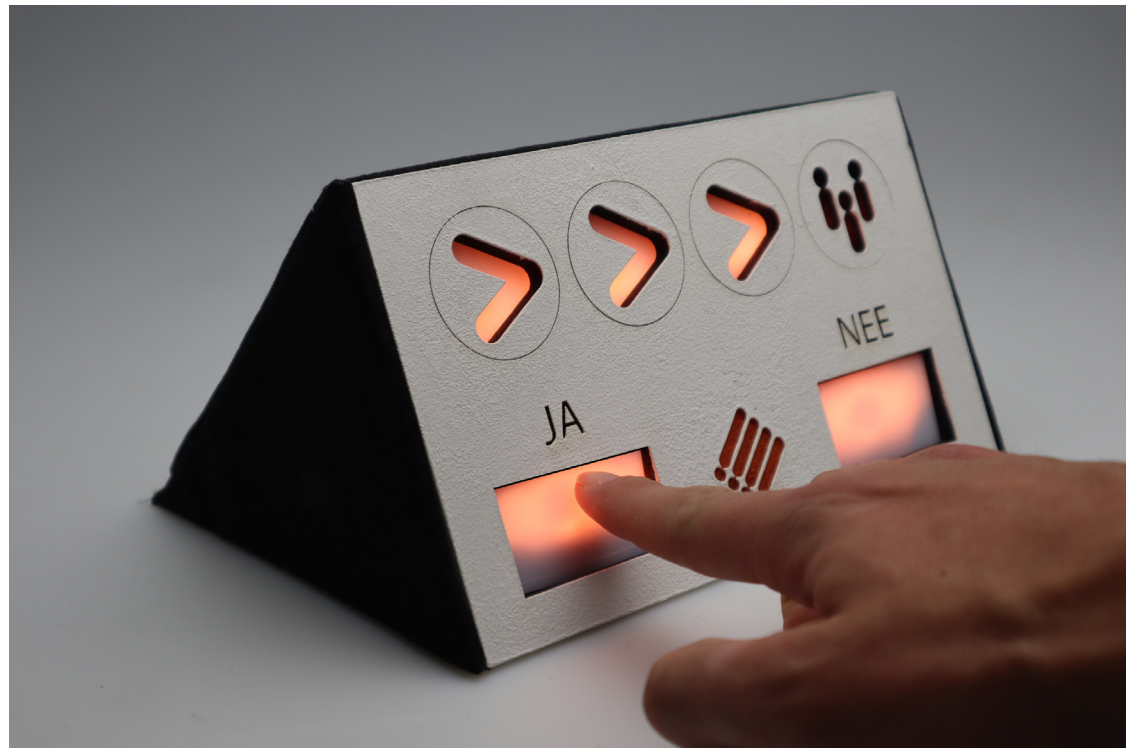


Figure 10: Test probe PAUSE. physical extension.

VALUE PROPOSITION

The end user of PAUSE. will be truck drivers. They will benefit from the service, but because of their low SES and the fact that they already have to invest by changing their habits, truck drivers are not suited to pay for the service directly. The real costumers would be logistics companies and service stations. Other important stakeholders are FNV and Rijkswaterstaat.

Logistics companies

By improving truck drivers' vitality through social encounters and at the same time collecting data on the different aspects of their workday and break, this service enables new and ambitious opportunities for logistics companies.

Literature and stakeholder research showed that truck drivers who are vital and enjoy their breaks, will most likely work more effective, longer, more customer friendly, be less absent, cause less accidents, and therefore deal with fewer delays and financial losses [13, 27]. Furthermore, a better work environment could attract new people to the sector. More employee influx will solve the shortages in manpower and accompanying delays that cause financial issues [32]. All in all, logistics companies will gain by limiting unnecessary losses and increasing performance. On top of that, data on employee vitality and resting place availability and experience, allows for understanding and optimizing truck drivers' workdays and break time.

Service stations

Break regulation makes truck drivers regularly present visitors of rest places along the highways. Nonetheless, stakeholder research showed they are no big costumers of the service stations located at these rest places. Therefore, engaging with these truck drivers could open up a new market opportunity for the service stations.

With activities at the rest stop linked to the active service station, truck drivers are bound to use the facilities more regularly and more extensively. This would allow the effects of the location to influence their buying behavior [35]. Even more, if the service would create the right social situation, it could make truck drivers more willing to buy products, as humans have the tendency to follow others' behavior [21, 28].

FNV

The transportation union is also an important stakeholder, but not necessary a paying customer. However, FNV could be essential in spreading the word and encouraging logistics companies to take on a membership.

Rijkswaterstaat

Rijkswaterstaat is important, since they take care of rest places and decide what is allowed there. Therefore, providing them value in data on truck drivers and their break locations could speed up the process of facilitating the activities.

Business model

The biggest portion of intended income should come from the logistics companies paying for the service by recurring fees. This would allow them to pay for memberships, granting each employee access to the connecting app and facilitated activities, with visualized data for the employer. However, the physical app extension makes the business model into a hardware-enabled service. The device is bought upfront, and only works in combination with the membership.

Service stations need to lease the specific installation or item(s) necessary to facilitate a certain activity in order to connect to the service. Furthermore, they can launch discounts or savings programs or advertise through the app. A percentage of the sales through this path goes to PAUSE.

Reflection, addition

As the process made it clear that the platform should be integrated, the app itself and a physical extension could be built into the truck and its digital ecosystem. Different truck manufacturers are already operating a variety of services and innovating their vehicles [10, 50], therefore it would fit to build this new concept. It would allow a certain truck manufacturing company to exploit the service, showing next to safety and solidity, also their interest in the end-users' wellbeing and overall experience. Becoming the company that delivers trucks accompanied with a social engaging and wellbeing improving service, could market them as the perfect partner for logistics companies.

ETHICAL CONSIDERATIONS

Designer's intention

A service has been designed that connects truck drivers while on the road, guiding them towards their break to do vital activities at rest places together. The service intends to facilitate proper breaks, in which truckers can genuinely regenerate from work activities and the accompanying worries. If used appropriately, the service could bring back social interaction during breaks at rest areas and could possibly lead to performing vital activities. The result would be better health and well-being for truck drivers, as well as improved job satisfaction.

Potential unethical situations

Traffic safety hazards and negative publicity

The most prominent risk is the unintended use of the app while driving, which could cause extreme traffic safety hazards. If the service would receive negative publicity due to a traffic incident, the reputation of investors in this service could be damaged.

Marginalization

As the concept is targeted at Dutch domestic truck drivers, the international and/or foreign trucker community might feel marginalized even more. In the most extreme case, this feeling of being left out could even be experienced by delivery service employees or normal drivers while stopping at rest areas.

In the starting phase the service might not be widely adopted by truckers. Therefore, if truckers would connect and do physical exercise together at rest areas, other truckers could look down upon them, as the stigma around exercising during the break still exists.

Environmental impact

If the service would turn obsolete on the long-term, the physical in-car app extensions would become waste products if the producers did not consider easy recycling of the product.

New social norms

A new social norm could even be established where people only meet each other (at rest areas) through planned get togethers, leaving less room for spontaneous interaction.

Risks around data

Gathered data can be misused by stakeholders for

capitalistic reasons. For instance, financial benefit by service stations through offering more unhealthy products may be put above the trucker's health. Moreover, truckers might feel observed and monitored even more if transportation companies get access to certain data from the service. Here confidentiality and anonymity are crucial factors. Lastly, data breaches could be a serious possibility. This would violate the privacy of individuals whose personal data has been breached. It could also bring economic harm to the businesses affected, losing potential competitiveness and damaging reputation.

METHODOLOGY

1.1 Study 1: Contextual research

The objective of this study was to scope the research context and empathize with the target group. Two methods were used during this study, namely contextual inquiry and a provotype-induced discussion. The approved ERB form can be found in appendix 4. The entire study should give insight in the following questions:

- What part of the life of a Dutch domestic truck driver can be improved during their workday?
- What are initial design principles for a design intervention?

1.2 Methodology – Contextual inquiry [39] along with qualitative observations [45]

A contextual inquiry is a field study that involves in-depth observation and interviews to understand the in-depth thought processes of users and the underlying structure of their activities [39].

A contextual inquiry semi-structured interview technique was used to collect qualitative data on the pains and gains of truck drivers. Alongside this method, researchers used qualitative observations – collecting data through researcher's subjective sensorial experience – to gather data on the limitations and opportunities of the environment of rest area Meelakkers 5661 PG Geldrop. For images on the rest area see appendix 9.

Researchers used purposive sampling to reach 7 Dutch

domestic truck drivers. Non-Dutch (speaking) foreign truckers were excluded to stick to the research scope. The consent form can be found in appendix 5.

On average, the contextual inquiry lasted 30 minutes per session whereas the qualitative observation was conducted throughout the entire stay. The following materials have been used during the research:

- A research plan to guide the research, including interview questions found in appendix 6
- Consent forms
- A camera to visually document the experiment
- A notebook and pen to document answers to the interview questions

The results were analyzed by performing content analysis to evaluate patterns in the gathered data [52]. The raw notes are found in appendix 7.

1.3 Methodology – Provotype-induced discussion

A provotype is a provocative prototype that is meant to explore the problem/solution space by providing tangible ideas to spark discussions [43].

A provotype – a route with accessible physical exercises which had to be entered through a physical door – was used to start a co-creative discussion on the unmet needs of truckers. The same purposive sampling method was used to recruit 2 participants, of which the consent form can be found in appendix 5.

Participants were asked to experience the provotype and engage in a discussion with the researchers, which lasted around 20 minutes. A full list of materials can be found in the research plan located in appendix 8. The results were analyzed using the same aforementioned content analysis technique and can be found in appendix 7.

2.1 Study 2: Concept evaluation and exploratory research on vital activities

The objective of this study was to evaluate the concept of an activity organizing service to bring truck drivers together during their break and to research what vital activities truck drivers prefer to do during their break at rest places. Therefore, the study was split into two separate parts accompanied by their respective meth-

odology. The entire study should give insight in the following questions:

- Is an app a good way to bring truck drivers together during their breaks?
- What type of activities would truck drivers prefer to do during their break at rest places?

2.2 Methodology – Contextual semi-structured interviews

A contextual semi-structured interview technique was used to gather qualitative data on the concept of a connecting and activity organizing service called 'PAUSE.'. Researchers used purposive sampling to perform interviews with 4 Dutch domestic truck drivers, of which 3 were offline and 1 online. The consent form can be found in appendix 5, the research plan in appendix 10.

Participants were interviewed on their thoughts on a Figma mock-up of 'PAUSE.'. The average interview lasted 45 minutes. The following materials were used during the interview:

- Consent forms
- A research probe, being the Figma mock-up of 'PAUSE.'
- A notebook and pen to document answers to the interview questions

The results were analyzed by performing a content analysis and can be found in appendix 11.

2.3 Methodology – Repertory Grid Technique

The Repertory Grid Technique is a highly structured interview based on George Kelly's Personal Construct Theory that elicit people's constructs without influencing them by the researcher's preconceived questions [12]. The Repertory Grid Technique was used to collect qualitative data on evaluating and understanding what activities truck drivers prefer to do during their breaks at rest areas. Purposive and voluntary response sampling was used to reach truck drivers 5 via online social media platforms Instagram, Facebook and LinkedIn. Screenshots of these participation requests can be found in appendix 12. Participants were asked to independently fill in an online repertory grid in MIRO on a selection of predefined activities accompanied with some extra questions along

the way. The URL's to the online repertory grid can be found in appendix 1. The following materials were used:

- A MIRO board with the Repertory Grid Technique
- Consent forms (appendix 5)

3.1 Study 3: Stakeholder research

The objective of this study was to understand the feasibility of an activity organizing service by pinpointing value propositions and power dynamics of the stakeholders. The research should give insight in the following question:

What are the interests and influences of the stakeholder?

3.2 Methodology – Self-administered online survey

Researchers developed self-administered online surveys which were used to gather qualitative data. Purposive sampling was used to contact 5 different stakeholders, namely the FNV (1 response), Rijkswaterstaat (2 responses), service stations (1 response), and Dutch domestic transportation companies (2 responses). The different consent form can be found in appendix 5.

Participants were asked to fill in the surveys independently and in their own time. These surveys differed slightly from each other to best comprehend the interests and influences of each stakeholder. On average, participants took 30 minutes to fill in the surveys. The following materials were used:

- Self-administered surveys
- Consent forms

The power interest matrix tool was used to analyze the results. The raw data can be found in appendix 13.

4.1 Study 4: evaluative research notification system

The objective of this study was to evaluate the success of an in-car system that notifies drivers on social breaks at rest areas while driving. The second approved ERB form can be found in appendix 4. The research should give insight into two sub-questions, namely:

- Can an in-car notification system encourage drivers to stop at a rest area for a social break from their drive?
- Do drivers prefer visual, auditory or tactile interaction with an in-car notification system while driving?

4.2 Methodology – A/B test

An A/B test accompanied by interviewing questions was used to evaluate which modalities are preferred to be stimulated while driving. The A-experiment, the physical in-car app extension, exposed drivers to visual guidance and demanded tactile input, whereas the B-experiment, the voice assistance, exposed drivers to auditory guidance and demanded verbal input.

Convenience sampling was used to gather 5 participants. Participants had to be at least 18 years old, own a driver's license, and deem themselves fit to drive in order to participate in the experiment. No exclusion criteria was set up. Participants were compensated for their expenses on gasoline.

Participants were asked to drive two routes with research probe A and B after first being introduced to the app PAUSE. At 4 moments, participants were interviewed to gather insights in their thought process. The detailed research plan, including the interview questions, route, and full list of materials can be found in appendix 14.

Results were gathered in the form of notes and analyzed using the content analysis technique. The raw notes can be found in appendix 15.

One or two sentences to describe the general purpose of the study and the research questions to be addressed.

RESULTS

Study 1: Contextual research

Contextual inquiry along with qualitative observations

Five main topics were discussed and reported on as a result of the contextual inquiry and qualitative observations.

Stress

Truckers indicated that they experience stress due to high workloads. Some truckers mentioned that breaks do not reduce this stress, for these are experienced as mandatory due to the strict resting times they need to obey. This in itself causes stress to some extent.

Breaks

Breaks are usually spent inside the cabin, as truckers do not have a purpose to go outside. Participant #3 described breaks as: "staring through the window and sitting out the break".

Rest areas

The uninviting nature of rest areas was also mentioned as a reason for not going outside. Researchers noticed that the rest area was dominated by unpleasant smells and loud noises. Moreover, the facilities and greenery looked badly maintained, combined with much trash laying around and people publicly urinating.

Social interaction

Social interaction has diminished according to trucker 7: "[breaks] are not as social as they used to be". The reason for this are busier and more unpredictable schedules, and a culture difference with a bigger scene of foreign truckers. Due to the solitary nature of the job, truckers seek social contact during the weekends and after work. This is sometimes combined with physical activities, such as participant 2 who enjoyed cycling with his wife during the weekends.

Vital activities

As truckers lack time and energy (after work) to perform vital activities and truckers confirmed common health issues, researchers proposed the idea of doing vital activities during the break. However, there seems to hang a stigma on exercising during breaks; it is seen as "too embarrassing" (#P6). Puzzling, contacting loved ones via social media or calling, eating, or stretching a bit are more common activities and socially accepted.

Lastly, four categories for potential vital activities were established:

- High intensity exercises (e.g. fitness, running)
- Low intensity exercises (e.g. stretching, walking)
- Cognitive challenges (e.g. chess, puzzling)
- Social-emotional activities (e.g. eating together, watching sports)

Provotype-induced discussion

Although researchers noticed that the provotype, especially the door, did attract attention from passing truckers, none of them approached. Yet, two recruited truckers did start a discussion with the researchers fueled by the stretching exercises. Participants 5 and 6 confirmed little break time, so an activity would need to be facilitated and accessible, such as "physio exercises" or "panna football for younger truckers".

Study 2: Co-creation

Contextual semi-structured interviews

Truck drivers indicated that they did plan breaks together, which usually occurs through WhatsApp. One trucker mentioned Zenly, an app that truckers have "claimed for themselves to contact others". During these breaks, truckers are willing to do recreational and social activities. Examples such as conversating and eating, or playing a small game of football were mentioned. Once introduced to the concept of an activity organizing service 'PAUSE.', truckers expressed positive feelings. Truckers argued that a dedicated app that lets truckers plan breaks while on the road would work, as this already happens but in an improvised manner. The feature of being notified on social breaks was also mentioned as interesting. Conditions for such an app included that it would be implemented well to differentiate itself from other apps and require low cognitive effort.

Repertory Grid Technique

No data was collected from the online repertory grid technique on the preferred activities to do during a break, as none of the recruited participants completely filled out the technique. However, insights were still gathered, which will be addressed in the discussion section.

Study 3: Stakeholder research

The results of the self-administered online surveys were assimilated into an influence interest matrix tool, as can be seen in figure 13. The following sub-sections walk through these results, starting with the most important (both influential and big interest) down to the least important.

Rijkswaterstaat

Rijkswaterstaat has the most influence regarding rest places, as they are responsible for conservating and maintaining rest areas by having close contact with contractors, police, and municipality. Although Rijkswaterstaat does not directly show interest in improving the well-being of truck drivers, they do highly prioritize traffic safety. Therefore, they do want to provide good facilities through safety and enough parking capacity. Acquiring data and handing this over in an aggregated or visualized way to Rijkswaterstaat would be of great value.

Transportation companies

As truckers are representatives of the company, keeping truckers vital and safe is important for transportation companies. They have a lot of influence on the vitality of truckers, as they can directly improve their health by providing education on exercise and nutrition, performing 'vitality checks', and regulating work schedules. Despite having a big interest on what is facilitated at rest areas, transportation companies do not have any say in this. As these companies already have data on their truckers, visualizing data on the experience of rest areas would benefit them greatly.

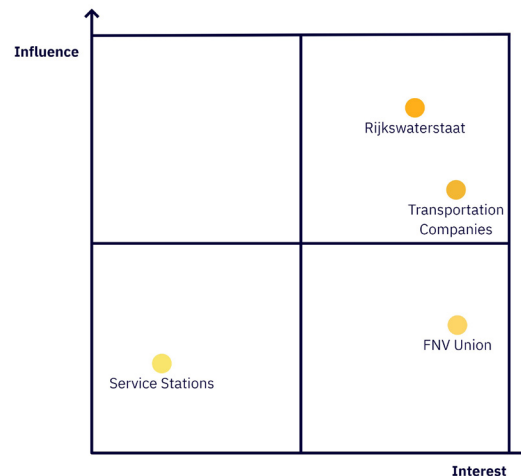


Figure 13: Data from the stakeholder research assimilated into an influence interest matrix.

FNV

The FNV union has high interests in trucker's well-being, road safety, and the conditions at the rest areas, but lack in influence. FNV uses collective labor agreement negotiations and the new Health & Safety Catalogue (ARBO) to amplify needs of truckers within the transportation sector. Almost no influence can be exercised on changing rest areas. FNV indicated that visualized data on trucker's workday, contents of their breaks, and facilities at rest areas would be valuable to have.

Service stations

Overall, service stations are mostly interested in maintaining healthy business operations. No interest was explicitly expressed in road safety, conditions at rest places, and well-being of truckers. Moreover, the influence of service stations on rest areas is limited, as they can only change and maintain facilities on their property leased from Rijkswaterstaat. As the surveys did not give answer to service station's influence on gathering data at rest places on trucker's breaks, this remains unknown.

Study 4: evaluative research notification system

Initial mental model physical in-car notification system

Understanding the interface of the physical in-car app extension and its purposes appeared to be difficult at first glance. Participants seem to not understand the difference between deciding to partake in a social break today and to join an ongoing break at the next rest area. Moreover, the process of being guided to the next rest stop was not recognized well, but rather associated with "different rest areas" (participant #2) the "amount of activities" (Participant #2) or "people joining the break" (Participant #3).

However, after an explanation of all meanings, participants recognized that their mental model was closely related to that of the indicated mental model of the researchers. Their understanding was further improved during the ride.

A/B experiment

Overall, participants expressed positive feelings for the concept of a connecting and activity organizing service

accompanied with an in-car notification system.

When asked to compare the interaction modalities for each system, the majority (all participants) of participants indicated a preference for verbal interaction with an in-car notification system over tactile interaction, as it felt safer. When participants were asked to compare the guidance functionality, the majority (4 out of 5 participants) indicated a preference for visual over auditory guidance, as it created a more engaged feeling on taking a social break. This is why participants suggested a combination of both modalities for an effective in-car notification system, provided that it remained simple in purpose and usage.

DISCUSSION

Research problem

The current transportation sector is all about rules and regulations, and working as efficiently as possible. This development leads to serious complications for truck drivers regarding their mental and physical well-being. The break is one of the few moments where Dutch domestic truck drivers can improve their well-being by meeting up and doing vital activities at resting places. Yet, this is not currently facilitated. Therefore, this research addresses whether an activity organizing service can connect working truck drivers in order to encourage them to do vital activities at rest places during their break.

Synthesizing key findings

Research concerning both users and stakeholders showed that there is room and need for a connecting and activity organizing platform, yet proper implementation will play a big role in the success factor of such platform.

Contextual semi-structured interviews with truck drivers showed a willingness towards meeting with colleagues and/or friends during their breaks. Some truckers, mostly the younger ones, already even use WhatsApp or other social contact apps like Zenly to get in touch and meet up. This was on one hand a good sign showing potential for the concept of 'PAUSE.', yet on the other hand gave the insight that a standalone app, both for safety and legal reasons, would not be the ideal solution to plan and connect while driving. This issue, alongside the information that truck drivers already use loads of apps for all kinds of reasons

during their workday, resulted in the introduction of an app extension.

This would be either a physical device inside the driver's cabin or voice control, both connected to the platform app. User testing both options resulted in the conclusion that a combination of visual guidance and speech control would be most favourable.

Determining what specific vital activities would be of interest for truck drivers turned out to be more difficult. Although four categories for vital activities (figure 5) and two conditions (accessible and recreational) were established, truck drivers cannot be generalized to determine the specific contents of these activities. For instance, some like gardening while others prefer to take a walk or play. These insights confirmed that truck drivers are willing to do a vital activity. However, no specific set of activities could be established for truckers within the timeline of the project.

Explanation of results & limitations

Although the direct feedback given on 'PAUSE.' as a concept was mostly positive, there were also some underlying aspects that were discussed, but also mainly experienced.

While researching and developing a concept of an activity organizing service like 'PAUSE.',

Busy lives of truck drivers

Truck drivers are living a busy life, they do not have a fixed schedule and are unable to plan ahead. This was experienced multiple times by the researchers. When planning to do a user test with truck drivers, there has been one case of cancelling 5 minutes before the test, because the truck driver suddenly had to pick up a load for the next day. Additionally, the second part of study 2 was not completed, as the recruited truck drivers did not have the time to fill out the online repertory grid. This shows that accessibility plays a major role in activating truckers. For future work, this means that both test procedures and interventions should highly prioritize accessibility as a design principle.

Especially during the user sessions done at the Meelakkers resting place, truck drivers were extremely negative about their job and during their breaks only sitting inside their trucks "staring and waiting for time to pass". This gave the initial impression that all truckers would be extremely individually minded, yet during

later sessions at other resting places, it became clear that the Meelakkers resting place lays along the direct route from the Rotterdam harbour to Germany and the people driving that route are more on themselves, therefore, the initial conclusion that truckers do not want to come out of their trucks had to be adjusted since the situation was not as extreme as initially thought.

Contact with stakeholders

Initially, it was decided to perform semi-structured interviews [11] to gather insights on the roles of stakeholders, as these would allow for quick follow-up questions. Due to time constraints, self-administered online surveys [33] were created and used. In hindsight, this resulted in less detailed information. However, the surveys did provide more structured data to be analysed compared to data from the contextual inquiries (study 1) or semi-structured interviews (study 2). Despite this structure, researchers still recommend face-to-face interaction to talk about stakeholders' interests and influences for more thorough insights.

Limitations of study 4

Study 4 was meant to find out which modalities are preferred to be stimulated while driving. While it did supply insights about the preferred modalities for interaction with an in-car system and guidance towards a rest area, the experiment does ask for improvement points.

First off, the decision was intentionally made to start with the physical in-car app extension, because starting with the voice assistance would create sequence bias for the functionalities of the physical in-car app extension. However, by following a short route and performing both interactions after each other, users felt like the choices made during test B were influenced by previous decisions made in test A. Therefore, the validity of the provided answers can be questioned. Researchers suggest using two separate groups for the A/B experiment to avoid possibly compromising answers.

Secondly, as the test has not been performed on truck drivers, but rather on drivers of automobiles, no clear conclusions can be drawn on the purpose of the service. To gain some insights into this, drivers were asked to place themselves in the shoes of a trucker during the experiment. However, the reliability of these

answers can be questioned. It is therefore recommended to test a future service with the intended users.

Lastly, as the research probes were not independently functionable, researchers had to be present in the car during the experiment. One can argue that this could have compromised the results. It is unknown if the presence of the researchers created pressure for the participants to provide the seemingly expected answers. Ideally, this can be avoided in future works by planning out the research procedures better, ensuring an independently functioning probe, and thus removing the researcher's presence.

FUTURE WORK

Because this study mainly focuses on the motivational and social aspects of the activity organizing service, some parts still need more in-depth research in order to be fully covered. The research into the actual activities needs to be reconsidered since truck drivers are a too diverse group to focus on specified activities. Instead, there needs to be looked into creating categories of activities that potentially even can differ per rest place, or even the creating of own/custom activities.

The app extension is an important aspect of the platform, yet there needs to be good consideration on how to combine tactile with verbal. The current prototypes of the app extension are solely made for the purpose of testing different interactions while driving. Yet the general concept of having an app extension device needs further looking into, also to keep it low-threshold and understandable.

The next phase would include direct contact with stakeholders. This time not so much about potential value for stakeholders, but about implementation opportunities and difficulties. Also, a business plan could be further investigated, to work towards the realization of the concept.

Overall, this paper can be used as a framework for further development of an activity organizing service that connects working truck drivers in order to encourage them to do vital activities at truck stops during their break.

CONCLUSION

Restate topic and importance

Although Dutch domestic truck drivers play a crucial

role in the Dutch economy, they experience mental and physical health issues that compromise job enjoyment and road safety. Breaks are important moments to properly recover from work activities, yet regulations on resting times and the atmosphere of rest areas upholds a threshold for truckers to take proper breaks. To this day, the topic of rest areas and facilitating proper breaks for truckers remains empirically unexplored.

Restate approach and solution

Through contextual inquiry and user interviews with truckers, pain points have been researched and opportunities found. An opportunity was pinpointed on facilitating and promoting vital activities, including social interaction, during breaks for truckers at rest areas. A concept for an activity organizing service called 'PAUSE.' along with an in-car notification system has been proposed to connect truckers to do activities together during their breaks. However, researchers recognized that a clear value proposition and business strategy was necessary to elicit change.

Summarize contributions

By proposing a potentially feasible solution of an activity organizing service, this research project contributes to a societal problem. The research performed and presented add to the limited database on Dutch domestic truck drivers and facilitating proper breaks at rest areas.

Further work

Future research could be done on the contents of vital activities. Moreover, it is recommended that a clear business model and plan should be made for such an activity organizing service before full development.

Broader context

With this research project, a foundation has been paved for ways to improve physical and mental well-being of truckers, increasing safety on the road and enjoyment in the job. This could improve the image of the profession, resulting in influx of new truck drivers and all together a better functioning transportation sector.

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CONTRIBUTION OF TEAM MEMBERS

A table describing the respective contributions of each team member to the design process and report can be found in appendix 16.

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