Smart trunk for light commercial vehicles by using AI with a human-centric approach

project title

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

start date 01 - 03 - 2021

16 - 07 - 2021 end date

INTRODUCTION **

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

The project's main stakeholder, Hoog+Diep is a multidisciplinary studio which explores opportunities with Ford Motor Company -who leads the commercial vehicle market in Europe- for developing smart and technological solutions for craftsmen. Craftsmen (handymen) is one of the biggest community that use these light commercial vehicles (LCV) to reach to the working site and to carry their tools, items or any type of loads that needs to be transferred. LCVs offer large spaces to fit and transport those tools and loads but also provides an infrastructure for craftsmen to personalise their vehicles for their specific needs with van racking systems or other storage solutions to remain organised. However due to the long working days, usually the neatness within the trunk cannot be ensured and this results in an overall chaotic look in the trunk which makes everything time consuming, complicated, impractical and harmful for physical health. Craftsmen transport various materials with them such as; small tools and consumables like screws, bolts, hammers. On the other hand they carry raw materials, power tools and order-specific items which can differ according to the task. Especially for large businesses where many handymen work with shared vehicles, it is essential to keep track of assets and tools that are stored in the vehicle. However, it is quite difficult for them to designate the location where the tool got lost considering both construction site and the trunk of the vehicle are chaotic and crowded contexts. Therefore, to solve this major and common problem Hoog+Diep developed a 'tool tracking' technology with Ford which functions with sensors and database of tools in order to locate where the specific tool got lost or forgotten. It is a big improvement made for such a distinctive user group, especially considering there are craftsmen who are really into analog and mechanical solutions unlike large companies who gives importance to technological and digital solutions. There are multiple reasons of these differentiations such as, cost, working culture, reliability and controllability.

Under favour of IoT, nowadays it is possible to transform every object into a data source. In automotive industry data is gathered to improve end-user experiences and inject the ability into vehicles to show empathy towards their users by understanding their needs. In fact, the drivers of next generation want their vehicles to remain connected and productive while on the go, with beneficial futuristic technologies. That means vehicles should be more than just a medium of transportation from A to B. The keystone for the generated data is the way of sharing them with the user. In order to benefit from the huge amount of information, it has to be clearly communicated with the user, only then the overall experience can be improved. In fact, customers are interested in data-enabled features that make mobility safer or more convenient and save them time or money. There are various ways to visualise and communicate generated data such as via dashboard screens, 2D interfaces, interactive installations, wearables etc. which can contain artificial intelligence. "Not only are AI technologies critical for enabling our autonomous vehicles, but they are playing an increasing role in transforming our customer and employee experiences", says Jeff Lemmer, vice president and CIO of Ford Motor Company which explains the significant potential clearly.

My role in this graduation thesis is to provide a detailed tangible concept design which helps for data communication by integrating AI. The properties of the proposed concept design should align with future expectations and demands of the target user and Ford, simultaneously fulfil the requirements of the context.

space available for images / figures on next page

introduction (continued): space for images

image / figure 1: Target user; craftsmen community

image / figure 2: The main context; trunk of a light commercial vehicle

Initials & Name _____ Student number _____

Title of Project Smart trunk for light commercial vehicles by using AI with a human-centric approach

PROBLEM DEFINITION **

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

The trunk of a commercial vehicle is just a confined space to store and carry tools for craftsmen. However contextual nuisances and inadequacy of smartness/assistantship puts the vehicle in a position of being just a medium of transportation. But the requirements and needs of craftsmen spawn exigence for the vehicle to enhance its functionality by adaptation of advanced and smart technologies. The aim of this project is; enhancing the smartness of the trunk of commercial vehicle range of Ford (Transit) and making craftsmen's working day easier with improving their efficiency by providing smart, practical solutions and aiding them towards the problems that they face during a regular working day. This will be done by exploring the ways of communicating the data that is generated within the trunk via sensors where craftsmen store all of their tools that are necessary for work. The generated data can be correlated with tool and asset management, inventory condition, weight distribution, restocking supplies or battery condition of power tools. Therefore, it is essential (1)to define specific use cases which has the most potential to be influenced with the upcoming design solution and (2)to conduct researches that will provide useful insights from the target user about their demands and needs, which will guide the designed product to be tailored for them. These executions will bring the design vision, goals and challenges following with the concept development. In each phase of the process, the design choices will be assessed and evaluated with target user by doing tests continuously in order to keep them involved.

Moreover, it is substantially important to formulate a product that fulfils the requirements of Ford. Therefore, the implemented design features must help to achieve a feasible and realistic design proposal in terms of affordability and cost, manufacturing, ergonomics, design strategy etc. that will align with Ford's approach. It is a must to ensure a positive impact on the society and industry with taking those significant points into consideration.

ASSIGNMENT **

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

Enhancing the smartness of the trunk of commercial vehicles by using AI with a human-centric approach. Exploring the ways of communicating the data that is generated within the trunk with a tangible concept design which will be structured and developed around the user insights and tests.

The final outcome of the graduation thesis will be a fusion of a tangible product and a service design, which will be evolved for a specific use case, that is able to visualise and communicate the data with the user, that are generated within the vehicle, in a more efficient way that will enhance the organisation from the minor (craftsman) to the major (business) level. The main role will be craftsmen who will influence the decision for what type of tangible product is going to be the most relevant for data communication. This will be done with continuous user tests and gathered insights on the entire design process. During those phases, the pitfalls, potential threats and questions such as, what type of data should be communicated with querying when, how and what for; will be answered and responded with a comprehensive solution.

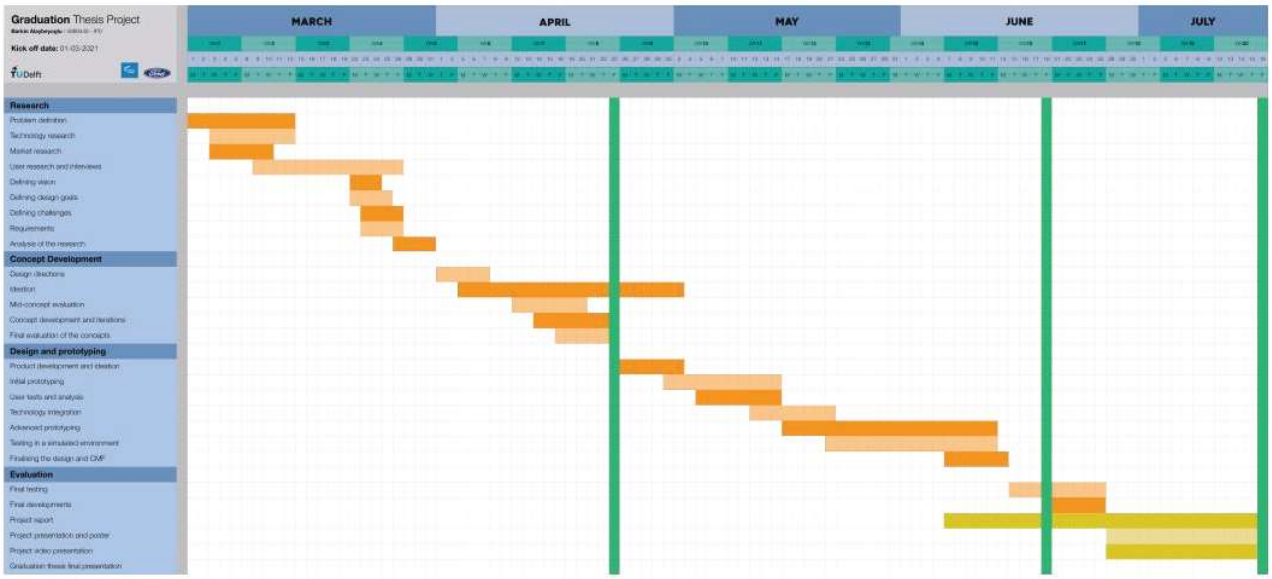
Initials & Name [redacted] Student number [redacted]

Title of Project Smart trunk for light commercial vehicles by using AI with a human-centric approach

PLANNING AND APPROACH **

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

start date - - end date - -



The 'Gannt' chart showing the process and planning of 20 weeks of the graduation project. It has divided into four phases; research, concept development, design and prototyping and evaluation. In some occasions, concept development and design and prototyping phases' stages can go simultaneously since they are influenced from each other. The first milestone is the mid-term evaluation which is on the 40th day. The green light meeting is scheduled on the 80th day and the final graduation presentation is on 100th day. Regular meetings with chair and mentor will be biweekly and the company will join if necessary. (More regular meetings will be scheduled if necessary).

I am going to work as a student assistant next semester for elective courses, thus, there might be minor changes on the planning if necessary.

Initials & Name _____ Student number _____

Title of Project Smart trunk for light commercial vehicles by using AI with a human-centric approach

MOTIVATION AND PERSONAL AMBITIONS

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

After the course ACD (Advanced Concept Design) which ended with a great outcome, I had a chance to work with Ford Motor Company for further development of my design proposal. It was a great experience also because of the fact that my ultimate ambition is to get into the automotive industry. During my education, by following latest technologies, exploring visions of automotive industry and also because of the significant benefits, I became enthusiastic about AI / machine learning and their potential advantages in terms of making products way more smarter and being able to emphatise with the user. Augmented and virtual reality also involves these advanced technologies and I had chance to get familiar with them last semesters, especially during Automotive 3D Design elective course which I was able to spent some time to improve myself by using VR and the software named Gravity Sketch. Such a captivating and interactable environment that can be manipulated and edited in any way. It is fascinating, how advantageous and educatory AI is, once it is implemented feasibly to the relevant context. Since I started to work with Ford Motor Company, I've been witnessed to their visionary and innovative approach which also motivates me for pushing the limits and explore the remarkable potential of AI for craftsmen and their van in order to enhance the overall working efficiency and provide practicality. On the other hand, I also would like to learn and have an idea about the technical side of these advanced technologies that demands algorithms and coding in case if it becomes essential to proceed on my design process. I am personally confident about the potential application, on the basis of my researches about where does automotive industry needs to go and what are their visions. I have always thought, it is a challenge to translate Data Enabled Design into something that is tailored for IPD mindset since the infrastructure of my graduation thesis is the datas that are generated within the vehicle via IoT. Usually for data communication, we often see 2D interfaces or screens that visualises certain informations for the user, but I am constantly questioning if it is the most relevant and smartest way to visualise and add meaning to data, especially when we consider the confined space where the technology will be implemented. Therefore, I am aiming for finalising the thesis with a tangible outcome that can be a medium/bridge for data communication which is a compelling challenge to tackle. Apart from the approach that I want to explore and implement, since it is going to be solo project from the first moment until the end, unlike many other courses provided by TU Delft, I believe it will be a great chance to learn new design methods and improve myself with handling multiple stakeholders who are responsible and expertised on different aspects. That is why, I will not hesitate to take bold decisions and initiative when it is necessary and I am planning to deep dive even further into Delft Design Guide, in order to not just for learning but also master myself for how to apply a certain methodology at it's most relevant phase.
About post graduation, I aim to step into automotive industry, hopefully with the help of a great result of my graduation thesis, since I believe it is kind of a showcase of ourselves after stepping out of the campus. I want to focus on developing conceptual solutions for the future of automotive industry with human-centric and vision-centric approaches to help companies to be one or even two steps forward than their competitors. Automotive industry is not like how it is used to be, it is much more technology and data oriented which makes them more than just a medium of transportation. And simultaneously with this metamorphosis, demands of customers also change rapidly. To be able to respond those demands, it is essential to act visionary. In this project, I also wanted to apply the same mindset and approach by starting with a conceptual and visionary idea and translate into something realistic and feasible forthe user by taking into every expertise area into consideration to create a comprehensive and beneficial design.

FINAL COMMENTS

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

Initials & Name _____ Student number _____

Title of Project Smart trunk for light commercial vehicles by using AI with a human-centric approach