IDE Graduation Assignment (version 2017.09.21) incl. the student's study progress (Appendix 3)

TU Delft Delft University of Technology

To be completed by the student
Please save your assignment as (format): IDE Graduation Assignment_family name, name_student number_dd-mm-yyyy
Place the proper document name on each page of your assignment in the headline, number the pages

Name student	Yannic de Jong	
Student number	4233883	
Address		
Zip- code, City		
Telephone	[redacted]	
E-mail address		
Start at IDE: 2012		Start at TU Delft: 2012

Bachelor [1]	**Master** [1]	**Specialisation** [1]
✓ TUD Bachelor IO	☐ IPD	☐ Medisign
☐ TU/e or UT Bachelor IO	☐ DfI	
☐ TU Delft non-IO BSc	✓ SPD	**Annotation** [1]
☐ Other Dutch University Bachelor	✓ GBS = 2nd non-IDE master	☐ Techn. in Sustainable Design
☐ HBO Bachelor	☐ Individual programme, date of approval [2]	☐ Entrepreneurship
☐ Foreign Bachelor	☐ Master Honours Programme	

Name Chair	Prof. dr. ir. Ruth Mugge

1. Check study progress

To be completed by the Shared Service Centre O&S after approval of the assignment by the chair. The study progress will be checked for a 2nd time just before the green light meeting.

Bachelor degree:	☐ Yes	☐ No	☐ N.A.

Missing 1st year Master courses	1. ..... 2. ..... 3.	4. ..... 5. ..... 6. .....

Master electives, no. of EC credits accumulated: .....

Name:	Date: ..... / ..... / 20.....	Signature:

2. Formal approval Graduation Assignment by the Board of Examiners

To be completed by the Board of Examiners

Approval of the content of the Grad. Assignment:	☐ Approved	☐ Not Approved
Procedural approval:	☐ Approved	☐ Not Approved

Comments:	

Name:	Date: ..... / ..... / 20.....	Signature:

[1] *Tick where appropriate.*
[2] *Date of approval of your individual programme by the Board of Examiners.*

IDE Graduation Assignment

GENERAL INFORMATION

Title Graduation Project [3]	**Creating a sustainable corporate mobility solution in the Netherlands**		
Chair of Supervisory Team [4]	Prof. dr. ir. Ruth Mugge (Professor of Design for Sustainable Consumer Behavior)		
Department / Section	PIM / Marketing and Consumer Behaviour		
Mentor of Supervisory Team [4]	MSc. dr. Nancy Bocken (Professor of Sustainable Business)		
Department / Section	PIM / Marketing and Consumer Behaviour		
Project commissioned by [5]	☐ Faculty	✓ Company	☐ Other, e.g. entrepreneurial
Project type [5]	✓ Design	☐ Research [6]	☐ Other, e.g. entrepreneurial
Company name, if applicable	Greenwheels		
City & Country	Rotterdam, the Netherlands		
Company Mentor	Ir. Paul Coppes		
Start date	27 November 2018		
End date	14 May 2019		
Remarks	Despite having a chair and mentor from the same section, this supervisory team will be especially valuable for this graduation project. Nancy Bocken has a background in sustainable business, while Ruth Mugge has a background focussed on design and sustainable consumer behaviour. This combination of both business and design expertise complements each other well, and will help me to successfully combine both aspects in this project.		

CONTENT

Ascertain that the text of your Graduation Assignment clearly meets and reflects the general and specific requirements for your specific IDE master. [7]
Write your assignment in a neutral form.
When inserting images or schedules in colour, make sure a print in black and white is still readable.

Introduction

Give a sketch of the context of your assignment. Historical developments, if applicable relevant published scientific research results, new trends, status quo; materials, technologies, usage, etc.

- *In case of a faculty project: describe how your assignment reflects the research portfolio of the IDE Faculty [6].*
- *In case of a company project: provide company information.*
- *If other, e.g. entrepreneurial: describe the future enterprise and how your assignment will be of value to the enterprise.*

Include an illustration or visual which depicts the context of your assignment.
In case one or more extra parties are involved in your project, indicate which role they play.

Currently there are almost 8.4 million passenger cars registered in the Netherlands and this figure is steadily increasing each year (CBS Statline, 2018). However, this growing number of vehicles negatively affects the frequency and severity of traffic jams and congestion (ANWB, 2018). In fact, traffic congestion in the Netherlands has already increased with 20% in the first three quarters of 2018 alone (Ritzen, 2018). Furthermore, passenger cars are responsible for an increasing amount of greenhouse gas emission (CBS Statline, 2018b).

[3] *Keep the title compact and simple. Do not use abbreviations.*
[4] *Avoid team members from the same section. In case a non-IDE mentor is preferred over an IDE-mentor, the Chair should request so for approval by the Board of Examiners (including a motivation letter and c.v. of the proposed non-IDE mentor).*
[5] *Tick where appropriate. See the IDE Graduation Manual, paragraph 2.5. If necessary, explain at Introduction.*
[6] *See webpage http://www.io.tudelft.nl/en/research/*
[7] *For general master specific requirements, consult article 4 of the Master Teaching and Examination Regulations, and the IDE Graduation Manual, especially paragraph 2.4 and 3.1.4.*

Another problem is air pollution, to which cars make a significant contribution. Air pollution, especially in the form of particulate matter, poses a serious threat to people's health (Carrington, 2018; Kampa & Kastanas, 2008).

Additionally, the increasing number of vehicles is causing a shortage of parking spots in inner cities. It is expected that this parking shortage will increase severely, especially in strongly urbanised areas (Coevering et al., 2008). In short, radical change in the way people use transportation is needed.

Sharing economy

Luckily, there is a significant societal change taking place that might contribute towards solving these issues. Attitudes towards consumption have shifted in recent years, spurring the transition of the current "make-use-discard" economy towards the "sharing economy" (Cohen & Kietzmann, 2014).

Hamari et al. (2016) define this "sharing economy" as: "The peer-to-peer-based activity of obtaining, giving, or sharing the access to goods and services, coordinated through community-based online services." As highlighted in this definition, the rise of this "collaborative consumption" has largely been supported by the rise of the internet and associated information and communication technologies. Due to these new technologies, the rapid sharing of access to goods and services became possible at a large scale. Other authors support this rising popularity of access-based consumption (e.g. Bardhi & Eckhart, 2012; Belk, 2014), though the success largely depends upon the product group (Edbring et al., 2016).

Researchers suggest that these alternative business models (e.g. product-service systems (PSSs)), could provide a promising solution to many of the sustainability issues that our society is facing today (Mont, 2002). A business model in this context is defined as: "A conceptual tool that contains a set of elements and their relationships and allows expressing the business logic of a specific firm. It is a description of the value a company offers to one or several segments of customers and of the architecture of the firm and its network of partners for creating, marketing, and delivering this value and relationship capital, to generate profitable and sustainable revenue streams" (Osterwalder et al., 2005).

Especially Sustainable Business Models (SBMs) seem like a promising solution for achieving sustainable development by incorporating a triple bottom line approach (Bocken et al., 2014; Stubbs & Cocklin, 2008). For example, Bocken et al. (2014) state: "SBMs are important in driving and implementing corporate innovation for sustainability, can help embed sustainability into business purpose and processes, and serve as a key driver of competitive advantage".

In practice, there are already many examples of new business models geared towards the concept of the sharing economy. Similar to the well-known Airbnb platform, where people are able to share their house with travellers, the mobility sector is also experimenting with new business models. This adaptation manifests itself in the form of peer-to-peer sharing of transportation means on online platforms. Examples of companies that enable these sorts of concepts are: Uber, BlaBlaCar and SnappCar.

Additionally, there are also companies that stimulate the transition towards collaborative consumption by offering access to their own fleet of public vehicles. Examples of such companies are MoBike, Zipcar and Car2Go. In the Netherlands, the company Greenwheels is one of the market leaders concerning this form of car sharing, and the company where this graduation project will consequently be conducted.

An overview of various alternative business models for car ownership is presented in the figure below.

Figure 1: Alternative business models. Adapted from Autodelen.info (2018).

Greenwheels

Greenwheels is a car sharing company based in Rotterdam. It was founded in 1995 by Gijs van Lookeren Campagne and Jan Borghuis based on the idea that owning a car is terribly inefficient. Research has supported this assumption, by showing that cars are not being used 95% of the time (ANWB, 2015). The founders therefore envisioned sharing a car with multiple people to not only be financially appealing, but also better for the environment since less cars will be needed in total.

In the starting years, Greenwheels grew rapidly by acquiring competitors in the Netherlands and partnering with the national railway company NS. This partnership allowed them to place their public cars near train stations all across the country, giving them a competitive advantage.

In 2013, Greenwheels became a joint venture of Volkswagen Financial Services (60% ownership) and Pon Holdings (40% ownership). This is no surprise, since a large number of automotive companies are reconsidering their traditional ownership business models and moving towards alternatives (see figure 2).

Figure 2: Initiatives of car manufacturers. Source: Autodelen.info (2018).

Currently, Greenwheels has around 1800 cars for public use in the Netherlands and around 300 public cars in Germany. Next to their fleet of public cars, they also manage around 800 non-public cars reserved for corporate car sharing clients in the Netherlands.

Problem definition
Indicate clearly, what should/could be improved compared to the present situation. When executing a research project: indicate the knowledge gap. What opportunities exist, what contradicting demands should be addressed, etc.

Greenwheels has the ambition to grow their corporate car sharing business over the coming years. However, they face three main hurdles, preventing them from accomplishing this goal.

First of all, there is a lack of knowledge on evaluating the mobility needs of potential corporate clients. Their business-to-business proposals are currently based on "gut-feeling", rather than a structured approach. This ambiguity makes it hard for Greenwheels employees to draft suitable mobility proposals for potential clients, resulting in inefficiency and uncertainty for potential clients.

Furthermore, the contemporary mobility market is changing rapidly with the rise of new concepts such as Mobility as a Service (MaaS). A MaaS concept combines different transport options to offer a personalised mobility package to consumers (Hietanen, 2014). Greenwheels is part of various Mobility as a Service (MaaS) concepts. Therefore, companies such as NS business-card, Shuttle, Radiuz and Next offer Greenwheels' services as a part of their own business proposition. A consequence of this development is an increasingly complex market context, since Greenwheels is no longer directly offering their corporate car sharing service to customers.

Finally, Greenwheels will need to keep adapting and innovating their business model and strategy if they want to stay relevant and profitable in the future. New technological developments such as autonomous driving and blockchain might change the corporate car sharing market quickly and radically. Therefore, Greenwheels will need to anticipate such changes and become proactive in their approach.

Assignment
Briefly and to the point, describe what you are going to design, create or generate to solve (part of) the problem.
In case of a Specialisation and/or Annotation, address specifically how this is/these are included in the assignment.

In order to maintain a strong market position in the future, Greenwheels aims to grow their corporate car sharing platform. To accomplish this goal, a design-driven innovation project is needed to overcome the previously mentioned problems. The assignment for this graduation project is therefore defined as follows:

"Creating a sustainable corporate mobility solution in the Netherlands."

In this formulation of the assignment, the term "sustainable" has two explanations. First of all, the result of this design project will incorporate sustainable development according to the Brundtland definition of sustainability. This definition is as follows: "Sustainable development meets the needs of the present without compromising the ability of future generations to meet their own needs" (Brundtland, 1987). In this sense, the outcome of the project will have to contribute towards reducing the negative environmental impact of the mobility sector.

Secondly, the result of this design project will have to be sustainable in the sense that it delivers Greenwheels with a long-term competitive advantage. This means that Greenwheels will have a differential advantage over competitors by having the most desired corporate mobility solution which is not easily copied.

Approach
What will be the approach to deal with the complexity of the assignment? What has to be done to meet the challenges? Indicate the main methodologies to be used. Indicate the same project phases as you distinguish in your planning. If one or more extra parties are involved in your project, indicate which role they play.
In case of a Specialisation and/or Annotation, address specifically how this is/these are dealt with.

The approach for this graduation project can roughly be divided into four different phases: Discover, Define, Develop and Deliver. This design process is based on the Double Diamond design process model (see figure 3), proposed by the Design Council UK (2005).

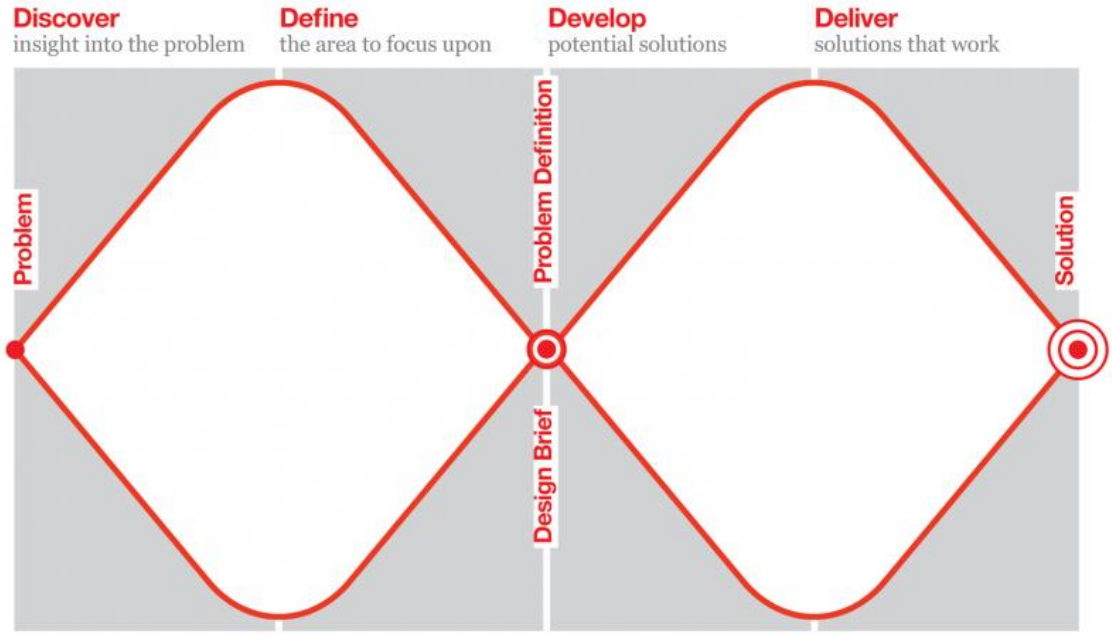


Figure 3: Double Diamond model. Source: Design Council UK (2005).

In this design process there are two distinct phases where divergent thinking will be applied and two phases where convergent thinking will be used. All four phases will be discussed in more detail below.

Phase 1: Discover
In the first phase of the project, divergent thinking will be used to generate insights about the company and the context using a variety of research methods. These insights are important in order to gain a thorough understanding of the relevant factors that play a role within this design project. For example, a literature analysis will be done on the concepts of sharing economy, mobility as a service and upcoming transportation technologies. Additionally, a company analysis, as well as external analysis, will be performed. Furthermore, interviews with relevant experts will be conducted.

Phase 2: Define
The second phase of the project will use convergent thinking in order to synthesize the findings of the first phase. The goal of this phase is to create a clear problem definition with a corresponding overview of relevant stakeholders and theories, as well as design challenges, requirements and desired outcome. These outcomes will give the project a clear focus and provide guidance towards the ideation in the next phase.

Phase 3: Develop
In the third phase, divergent thinking will be used to come up with solutions for the previously proposed problem definition. The main activity during this phase will be ideation and concept testing. Ideation will be done by focussing on co-creation with experts and using brainstorming sessions. Concept testing will mainly be focussed on testing a minimal viable product (MVP), preferably in combination with a pilot at a potential client. This process might repeat itself a few times, adapting the concept with each iteration. Using this approach, it will be possible to quickly develop and test various concepts.

Phase 4: Deliver
In the fourth and final phase of the project, a final concept will be selected using convergent thinking supported by selection methods. Consequently, this final concept will be further detailed. Additionally, an implementation plan will be developed in order for Greenwheels to successfully introduce the new concept to the market. The main goal of this phase it to deliver a fitting solution to the previously defined problem and to present the final deliverables of this graduation project in a convincing way to both the company and the supervisory team.

Figure 4: Four phases of the project

Graduation Project results

1. Describe the expected results or outcome of your Graduation Project. For instance, a product, a product-service combination, a strategy illustrated through product or product-service combination ideas.
2. Indicate the expected scientific and/or societal and/or commercial significance of the outcome of your project.
3. In case of a Specialisation and/or Annotation, address specifically the relevant results to be expected.

Expected results and outcomes

- A solution at concept level for the problem definition formulated during phase 2 of the project, most likely in the form of a product-service combination.
- A tool or framework developed for defining the mobility needs of corporate clients.
- A strategy to deal with the changing mobility market in the future, most likely in the form of a roadmap.

Significance of the project

Not only will the outcomes of this graduation project have a societal significance by providing a solution for traffic congestion problems in the Netherlands, it will also contribute towards solving climate change by focussing on sustainable development. Furthermore, this project could significantly contribute to literature on the sharing economy, Mobility as a Service and sustainable business model innovation.

Deliverables

List the extra graduation deliverables, if any (apart from the mandatory deliverables being the thesis report, annexes if any, the poster and the representative pictures). For instance, a working prototype or a paper.

- Innovative corporate mobility solution at concept level.
- Roadmap towards the future of mobility, including a strategy for Greenwheels.
- Implementation plan focussed on introducing the final concept to the market.

Relation and relevance to the domain of Industrial Design Engineering, the chosen master direction and the IDE pillars

Explain the relation of your project with the domain of Industrial Design Engineering and your master direction IPD, DfI or SPD.
1. Relation of you project to the master IPD, DfI or SPD
Furthermore describe the interface of your project with each of the IDE pillars:
2. Business
3. Human Interaction
4. Technology

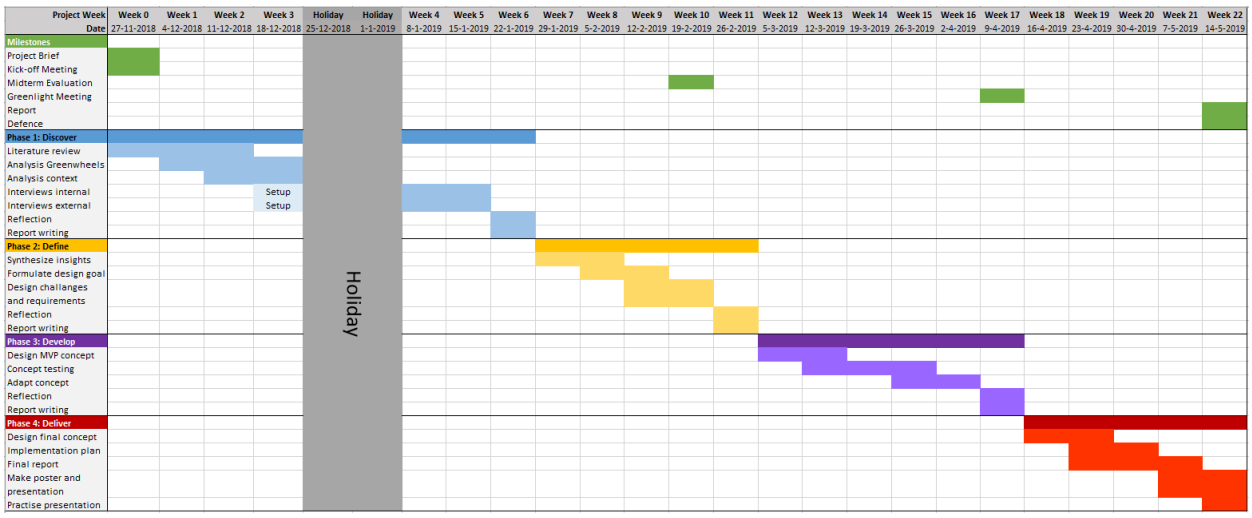
Relation and relevance to IDE and SPD
This graduation project is highly related to the Strategic Product Design master program, since it requires a user-centred approach, complex problem solving and the development of a future strategy for Greenwheels. Overall, it is related to the domain of IDE, since it is a design-driven project that will utilize various design methods and principles in order to conduct research and to generate a suitable concept.

Business
Since this project is executed in collaboration with a company, it will be important to gain a thorough understanding of the organisation and its business context before developing any sort of solution. This way, it will be more likely that the final concept fits the company and it can successfully be implemented at the final stage of the project.

Human Interaction
Human interaction will play an important role in different aspects of this project. Not only the human interaction between (potential) corporate clients and Greenwheels will need to be researched, but also the interaction between the end-users and service providers of Greenwheels. Additionally, the company culture at the corporate clients (end-users amongst each other) will be taken into account.

Technology
Technology has always been one of the most important drivers for innovation in the mobility sector. It will therefore play an important role in this project as well. For example, the developments surrounding autonomous driving, electric vehicles (EVs), Internet of Things (IoT) and blockchain and their impact on the mobility market will need to be included in this project.

Planning
Present your planning in a Gantt Chart, which can easily be made in Excel, see example underneath. Make sure a print in black and white is still readable. Mention the main phases of the project as described at Approach + number of weeks. Indicate only main activities, milestones, meetings. Take notice: 33 EC = 22 full-time weeks! Indicate periods of part-time graduation project activity and/or periods of not spending time on your graduation project, if any, for instance because of holidays [8].



Brief explanatory remarks on the planning, if any.

In the planning above, the four phases of the project are clearly marked with a distinct colour. The graduation project takes place between 27/11/2018 and 14/6/2019. The first week, where the kick-off will be hosted, will not count towards the total of 22 project weeks.

Further comments and information
In case your Assignment needs further comments, please add any information you think is relevant.

[8] *Only by approval of the Board of Examiners , a not yet passed course may be combined with the Graduation Project. In such case, show the approval to your Chair and indicate the period of not spending time on your Graduation Project for this reason.*

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APPROVAL BY CHAIR

Date of approval	

Signature of Chair	