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User Acceptance of Autonomous Vehicles

Factors & Implications

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User Acceptance Of Autonomous Vehicles: Factors And Implications

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Summary

Introduction:

Self-driving cars have developed rapidly in recent years, diminishing the technological barriers blocking the introduction of the technology. Besides these technological barriers however, there are other issues, such as user acceptance, that need to be dealt with in order for autonomous vehicles to be successfully introduced to the market. One of these issues is user acceptance. Getting a clear view of the user acceptance of self-driving cars is especially relevant for parties such as the national government and the automotive industry, who might benefit from the introduction of autonomous vehicles, and would therefore like to ensure that the technology becomes a success. This master thesis research looks into the factors that influence the user acceptance of self-driving cars through a series of interviews, after which the implications of these factors the government and the automotive industry are considered.

Theory & Literature:

Before the issue of user acceptance can be addressed, it is important to have defined the term accurately. In this research, the definition by Dillon and Morris (1996) is used, who define user acceptance in the context of information technology as the demonstrable willingness within a user group to employ a technology for the tasks it is designed to support. It is also important to distinguish between 'consumer acceptance' and 'citizen acceptance', as indicated by Huijts, Molin, and Steg (2012). Since these two forms of acceptance both influence each other and cannot be separated completely, both are considered to be part of the term user acceptance as referred to in this research. Since people with a driver's license are mostly considered in this research however, and since it is expected to play a larger role in the success of the technology, a larger emphasis is placed on consumer acceptance.

Although existing literature has already identified many factors influencing user acceptance, it is widely agreed on that many factors are still unknown. On top of that, these factors have been found through surveys, meaning that the underlying reasons for their inclusion remain unclear. This research aims to understand why certain factors play a role, by using interviews with open ended questions as a method. This better understanding also makes it easier to investigate the strategic implications for stakeholders such as the government and the automotive industry, which is also a gap in the research that has not yet been addressed, as indicated by Nordhoff, van Arem, and Happee (2016).

Research methodology:

The gaps in the literature are addressed by finding answers to the following two main research questions:

Which factors and their underlying reasons play a role in the user acceptance of self-driving cars?

and

What are the implications of improved knowledge on user acceptance for the automotive industry and governments?

In order to answer the first research question, 35 interviews were conducted among a young target audience between the ages of 18-40. The questions during these interviews were open in nature, in order to minimize the influence the effect of the questioning and to assess which factors candidates come up with themselves. At the end of these interviews, the candidates were presented with a table of previously identified factors, and asked to rank the 5 most important factors influencing their personal acceptance of self-driving cars.

In order to answer the second research question, the findings and conclusions of the first research question were used in combination with questions asked during the interviews about the role of the government and the manufacturers, leading to a number of implications for these parties. 4 Experts were also interviewed, and were presented with the findings and results of the research. These experts were then asked to give their opinion about the results, and to add whether these findings differ from existing research and their experiences in this field.

Results:

35 Candidates from 12 different nationalities were interviewed on their acceptance of self-driving cars. 18 Of these candidates were male, while 17 were female. The average age of the interviewees was 25,29 years old.

Generally, people were found to have a positive to neutral view of the technology, with only a few candidates looking negatively towards the introduction of self-driving cars. A potential reason for the fact that many candidates reacted neutrally towards the technology, is that many people claimed to not know much about the self-driving cars, making it difficult for them to have a clear view of the technology.

The factors found and the responses given by the interview candidates were categorized under 'personal factors' and 'technological factors'. Technological factors were then further split up into 'benefits', 'drawbacks' and general factors. Some of the most mentioned factors were perceived safety, pleasure of driving, the ability to spend time on other activities, and the so called 'transition period'. It is interesting to note that many of the categories received far fewer mentions than the maximum of 35. A likely explanation for this is the fact that most people are unaware of many of the advantages and disadvantages of self-driving cars, meaning that they are unable to form a well-considered opinion on the technology.

In the table given to the candidates at the end of the interview, safety turned out to clearly be the most important factor. Decreased traffic congestion however received the second most mentions, while it was mentioned only 6 times by candidates during the open questions. Similar differences can be seen for 'enhanced mobility for elderly, young, or impaired' and 'higher speed limits', which were much more popular in the table. Pleasure of driving on the other hand was mentioned 21 times during the open interviews, but was not considered important by many in the table. Again, a possible explanation for the

discrepancy in results between the interviews and the table might be explained by the fact that many people are not consciously aware of many of the advantages and disadvantages of self-driving cars. When confronted with them in the table however, many people do see their importance and often rank them higher than factors that they have mentioned, such as pleasure of driving.

Table 1 Table with factors provided to interview candidates

| Factors playing a role in acceptance | # of times mentioned |
|--|----------------------|
| Safety | 30 |
| Decreased traffic congestion | 15 |
| Ability to spend time on other activities | 14 |
| Comfort with the technology | 14 |
| Enhanced mobility for elderly, young, or impaired (drunk people, etc.) | 13 |
| Type of traveling (roadtripping or commuting to work) | 11 |
| Economic costs | 11 |
| Amount of self-driving cars already on the road | 11 |
| Ease of using the technology (navigating, configuration, etc.) | 10 |
| Ethical issues | 8 |
| Ability for car sharing | 7 |
| Higher speed limits | 7 |
| Pleasure of driving | 6 |
| Loss of jobs (taxi/truck drivers) | 3 |
| Social influence through word of mouth | 2 |
| Loss of privacy | 2 |
| Hunting for parking eliminated | 1 |

Discussion:

The findings of this research show that many people appear to be unfamiliar with all the benefits and drawbacks of self-driving cars, and that they are unable to form a clear image of what the technology entails. As a result of this, many people appear to be uncomfortable with the mix of self-driving and non-self-driving cars on the road, as they instinctively assume this to be dangerous, even though there is no evidence suggestion that this is actually the case.

These two findings lead to a number of implications for both the government and the automotive industry. First of all, the lack of awareness of the existence of many of the benefits of self-driving cars means that this is an area both parties should focus on. On top of that, the government should prepare for the market introduction of self-driving cars in terms of regulations, ethical dilemmas and infrastructure, although interviewed experts stated that it is often difficult to take concrete actions already. Potentially subsidizing the technology in the initial phase is something that the government should also look at.

The automotive industry should mainly focus on improving the image that people have of self-driving cars, and to increase the awareness of the benefits in particular through demonstrations. By being transparent about testing, and by working together with the government, people's trust can also be agreed. These tests can also serve a secondary purpose, as testing on the open roads can also be seen as a form of demonstration of the technology. Finally, manufacturers are recommended to introduce the technology in steps, and to start promoting it early, as this gives people time to get used to the technology. One expert stated that this is likely to happen anyway, as the automotive industry has historically always been evolutionary in nature.

Conclusions

In this report answers were found to the two main research questions formulated. First, an answer to the following research question was found:

Which factors and their underlying reasons play a role in the user acceptance of self-driving cars?

The existence of these factors was not only confirmed, but the underlying reasons given by candidates were also discussed, making this research go further than the existing literature. The findings in the interviews were then compared with a table given to the interview candidates afterwards. The first of the two key findings is that there seems to be a lack of awareness of many of the factors influencing the user acceptance of self-driving cars, and that this is especially the case for the advantages of the technology. The second key finding is that many people seem to be uncomfortable with the so called 'transition period', in which a mix of self-driving and non-self-cars cars will be on the road together.

Based on these findings and the suggestions made by candidates on implications for the government and the automotive industry, an answer was formulated to the second research question.

What are the implications of improved knowledge on user acceptance for the automotive industry and governments?

The main implication for both parties is that the lack of awareness needs to be addressed, in order to get a more accurate picture of the true opinion people have of self-driving cars. This should be done slowly and in steps, while simultaneously preparing regulations and infrastructure for market introduction. Since level 4 autonomy vehicles are still not on the market yet, it seems to be premature to start targeted advertising campaigns. All in all this means that both the government and the automotive industry should closely follow the developments in the market, in order to be ready to take the right steps as soon as it makes sense to do so, and to not rush the market introduction.

Limitations

Some of the limitations of this research were the fact that the results are difficult to generalize, as many factors were only mentioned by a small number of the already small sample of 35 interview candidates.

Many of the results were derived from the differences in results between the open questioning method and the table provided to candidates. The way in which questions were asked, or the order in which factors were presented in the table, might also have influenced the results and could therefore weaken the claims made in this research. It was also not looked at whether factors are seen as prerequisites for acceptance, or considerations, which might be an interesting area for future research. The effects of the environmental impact of the technology on user acceptance are also interesting to consider in future research. Another potentially interesting suggestion for future research is to look into the effects of framing on user acceptance, as many people still do not have a clear view of self-driving cars. Finally, conducting similar interviews with a different target audience might be interesting, in order to find differences between groups of people, e.g. younger and older people.

Table of Contents

| | |
|--|-----------|
| List of Figures..... | viii |
| List of Tables..... | ix |
| 1 Introduction | 1 |
| 1.1 Research Problem | 1 |
| 1.2 Research Objective..... | 2 |
| 1.3 Research Questions..... | 2 |
| 1.4 Research Framework..... | 3 |
| 1.5 Report Structure..... | 4 |
| 2 Theory & Literature | 5 |
| 2.1 Literature Research | 5 |
| 2.2 Relevant Topics | 6 |
| 2.3 Definitions..... | 6 |
| 2.3.1 User Acceptance & Influencing Factors | 6 |
| 2.3.2 Autonomous Vehicles..... | 7 |
| 2.3.3 Levels of Automation..... | 7 |
| 2.4 Motives for Automation..... | 9 |
| 2.5 User Acceptance of New Technological Innovations..... | 10 |
| 2.5.1 Technology Acceptance Model (TAM)..... | 10 |
| 2.5.2 Technology Acceptance Framework..... | 12 |
| 2.5.3 Unified Theory of Acceptance and Technology Use (UTAUT)..... | 13 |
| 2.5.4 Relevance of models for proposed research | 15 |
| 2.6 Acceptance of Autonomous Vehicles | 16 |
| 2.7 Role of other Stakeholders..... | 20 |
| 2.8 Chapter Implications | 21 |
| 3 Research methodology | 23 |
| 3.1 Data collection | 23 |
| 3.1.1 Interviews..... | 23 |
| 3.1.2 Interviews with experts | 25 |
| 3.2 Data analysis | 25 |
| 3.2.1 Interviews..... | 25 |
| 3.2.2 Interviews with experts | 26 |
| 3.3 Chapter implications | 26 |
| 4 Results | 27 |
| 4.1 Personal factors | 29 |
| 4.1.1 Self-perceived Knowledge of the Technology..... | 29 |
| 4.1.2 General view of the Technology | 30 |
| 4.1.3 Perceived Safety & Trust | 31 |

| | | |
|----------|--|-----------|
| 4.1.4 | Comfort with the technology | 32 |
| 4.1.5 | Pleasure of driving..... | 33 |
| 4.1.6 | Social influences | 34 |
| 4.1.7 | Gender..... | 35 |
| 4.1.8 | Age | 35 |
| 4.2 | Technological factors | 36 |
| 4.2.1 | Ability to spend time on other activities..... | 36 |
| 4.2.2 | Decreased traffic congestion | 37 |
| 4.2.3 | Enhanced mobility for elderly/young/impaired | 37 |
| 4.2.4 | Ability to share car & Autonomous parking..... | 37 |
| 4.2.5 | Ethical issues | 38 |
| 4.2.6 | Cost | 39 |
| 4.2.7 | Loss of jobs | 39 |
| 4.2.8 | Security Issues | 40 |
| 4.2.9 | Ability to drive manually..... | 40 |
| 4.2.10 | Transition period | 41 |
| 4.2.11 | Ease of using the technology | 41 |
| 4.3 | Table with factors..... | 42 |
| 4.4 | Role of National Government & Automotive Industry | 43 |
| 4.4.1 | Role of National Government..... | 43 |
| 4.4.2 | Role of Manufacturers..... | 45 |
| 4.5 | Reflection on results | 47 |
| 5 | Discussion of results | 49 |
| 5.1 | Factors found & Underlying reasons | 49 |
| 5.2 | Implications government & automotive industry | 52 |
| 6 | Conclusions, Recommendations & Reflection | 55 |
| 6.1 | Conclusions | 55 |
| 6.2 | Limitations..... | 57 |
| 6.3 | Recommendations for future research | 57 |
| 6.4 | Reflection | 58 |
| A | Interview Protocol..... | 59 |
| B | Interview with experts protocol..... | 63 |
| C | Coding of interviews | 68 |
| D | Interview Riender Happee (Expert 1) | 87 |
| E | Interview Taede Tillema (Expert 2)..... | 89 |
| F | Interview Bert van Wee (Expert 3) | 90 |
| G | Interview Filippo Santoni De Sio (Expert 4)..... | 91 |
| | References..... | 93 |

List of Figures

| | |
|--|----|
| Figure 1-1 The research framework | 4 |
| Figure 2-1 Summary table of levels of driving automation according to SAE standard J3016 | 8 |
| Figure 2-2 Visual representation of the Technology Acceptance Model. (Davis, 1985) | 11 |
| Figure 2-3 A schematic representation of the technology acceptance framework. (Huijts et al., 2012) ... | 12 |
| Figure 2-4 Visual representation of the Unified Theory of Acceptance and Technology Use (UTAUT) (Venkatesh et al., 2003) | 15 |
| Figure 2-5 The research model proposed by Choi and Ji (2015)..... | 16 |
| Figure 4-1 Visualization of the found factors and their relations | 47 |

List of Tables

| | |
|--|----|
| Table 2-1 Models and Theories of Individual Acceptance (Shortened version of Table 1 in Venkatesh et al. (2003)) | 14 |
| Table 2-2 Overview of identified factors and future recommendations in existing literature | 18 |
| Table 4-1 Coding categories identified during interviews..... | 28 |
| Table 4-2 Table with factors provided to interview candidates..... | 43 |

1 Introduction

1.1 Research Problem

Thirty years ago, autonomous vehicles were still something one would only find in sci-fi movies. Since then, technology has advanced rapidly and it seems like self-driving cars are already much closer to becoming a reality than many people expected. Although research into the possibilities of autonomous driving was already being conducted in the '80s and '90s (Urmson & Whittaker, 2008), it was quite apparent that the technological capabilities were still insufficient. This didn't change for a long time, until the U.S. Defense Advanced Research Projects Agency (DARPA) wrote out the DARPA Grand and Urban Challenges (Thrun, 2010; Urmson & Whittaker, 2008), which were a huge success and led to significant technological advances. Google was one of the first companies who took notice and started a project to develop a self-driving car, for which it hired Sebastian Thrun (Poletti, 2016), whose team won the DARPA Grand Challenge. As of 2016, Google's self-driving car project had already driven more than 2 million miles autonomously (Google, 2016) and it had received plenty of media attention. Other companies followed, such as Tesla with its Autopilot function, of which the second version claims to be capable of driving at a safety level substantially greater than that of a human driver (Tesla, 2016). Today, virtually every major car manufacturer has started working on autonomous driving, and it is expected that it won't take long for most manufacturers to bring their first self-driving cars to market. Carlos Ghosn, chief executive of Nissan Motor Co., has already promised to introduce an entire line of self-driving cars by 2020 (Ross, 2014).

The reason the development of autonomous vehicles has gained momentum so rapidly is the fact that this type of vehicle provides substantial benefits over conventional cars. Improved traffic safety, which could reduce the 42,000 annual deaths due to traffic accidents in the United States alone (Thrun, 2010; Urmson & Whittaker, 2008), significantly better fuel economy (Luettel, Himmelsbach, & Wuensche, 2012; Payre, Cestac, & Delhomme, 2014), and car sharing (Ross, 2014) are just a few of the many benefits that the introduction of self-driving cars brings to the table.

Self-driving cars also bring some problems along however, which need to be solved in order to make sure the market introduction becomes a success. It could be argued that the pace of development has led to technological enthusiasm, and that issues such as user acceptance and ethical dilemmas have not been given sufficient attention. Rosenzweig and Bartl (2015) claim that merely 1,3% of publications on autonomous driving concern the topic of user acceptance. Although research has been done on ethical decision making (Ackerman, 2016; Bonnefon, Shariff, & Rahwan, 2016; Goodall, 2014) and user acceptance (Bjørner, 2015; Choi & Ji, 2015; Nees, 2016; Payre et al., 2014), there are still many questions

that remain. This is further elaborated on in section 2, where it is shown that many of the identified factors have been found through surveys, and that underlying reasons for the importance of these factors are not found. On top of that, the implications of these factors for other stakeholders have not been looked into. These issues are especially important for highly automated driving systems, also labeled as Level 4 or higher by the Society of Automotive Engineers (2014), or SAE, which are the main focus of the research proposed here.

Having a clear understanding of the factors that influence user acceptance and the implications this has for both the automotive industry and governmental institutions could help address these potential issues, and ensure that the societal benefits of the technology can be realized. The research proposed aims to identify those influencing factors by conducting one on one interviews, and tries to combine these findings with existing literature, which will then be used in another round of interviews with experts in order to come to meaningful conclusions.

1.2 Research Objective

The objective of this research is to improve the knowledge on factors that potentially influence the user acceptance of level 4 or higher self-driving vehicles (Society of Automotive Engineers, 2014), and to use the knowledge obtained in order to foresee the potential implications this improved knowledge has on the actions of both the automotive industry and governmental institutions. To realize this research objective, existing literature is examined to find previously found factors, one on one interviews are conducted to confirm these factors, find additional factors and the reasons for their inclusion, and implications for the government and automotive industry. In a second interviewing round with experts, these results are validated and reflected. It is not expected that the results of this research will solve the problem outlined, but it is expected to make a meaningful contribution to how companies and governments can manage these problems.

1.3 Research Questions

The research proposed in this paper consists of two parts, which will be addressed using two research questions. The first research question is as follows:

Which factors and their underlying reasons play a role in the user acceptance of self-driving cars?

Answering this research question will be done in three steps. First, existing literature will be used in order to find previously found factors that might play a role in the acceptance of self-driving cars. This

information will then be used in the second step, where a series of interviews will be conducted with the same goal of finding potentially influencing factors. The results and findings that are found are then presented to experts in a third step, where they are asked to validate the results. It is important to mention that although existing literature is used, finding the factors still has a mostly explorative nature.

When an answer to this main research question has been found, the results found will be used to address the second research question, which is as follows:

What are the implications of improved knowledge on user acceptance for the automotive industry and governments?

It is important to note that the first research question represents the core of the proposed research, and that it will be the main focus of this paper. The second research question aims to place the results found in the first research question into a societally relevant context. The answer to this question will be found by asking interview candidates what actions these parties should take, as well as by drawing conclusions based on the results found in the first research question.

Finding the factors that people are most likely to associate with their acceptance of self-driving cars is an important step in order to be able to give a meaningful answer to the second research question. After all, the problems first need to be clear before they can be dealt with by actors such as car manufacturers and the national government.

In the next section, the research method that will be used and the required data will be presented.

1.4 Research Framework

Figure 1-1 illustrates the research framework used in this research. It shows the steps that are taken to come to the desired results at the end of the project. The framework can be split up vertically in three phases; (1) the orientation and literary study phase in which the research problem is identified, (2) the phase in which the two interview rounds take place, and (3) the results phase in which the findings from the second phase are used to draw conclusions and make recommendations. Note that the responses from the interviews provide both input that will be used in setting up the interviews with experts, as well as results that will be used to draw conclusions.

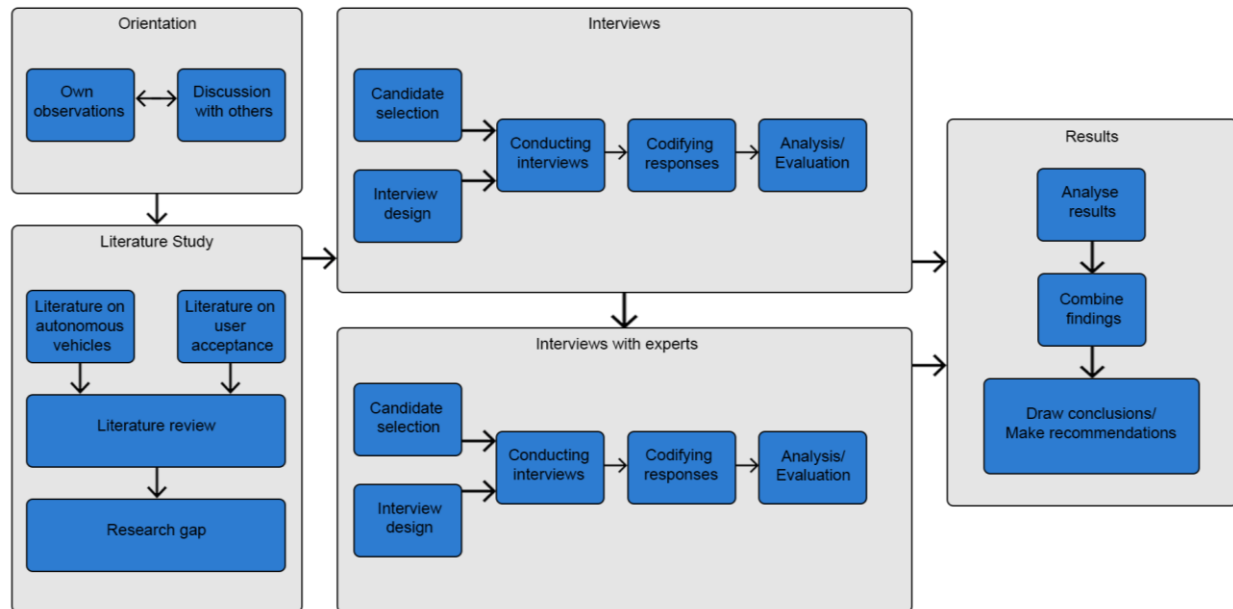


Figure 1-1 The research framework

The first research question can therefore be answered before the second research question, as the findings from the first research question will be used in answering the second research question.

1.5 Report Structure

The reports is structured as follows. In the next section, the theory and relevant literature will be discussed. The third section will elaborate on the research methodology, while section 4 will show the results that have been found. Section 5 will then discuss the results found. Finally, section 6 will provide conclusions, limitations, and recommendations for future research.

The next section of this proposal will discuss the main research questions. Section 3 will discuss the research methods used in order to answer these questions, after which the fourth section will discuss the possible outcomes of the research. After all this has been done, section 5 will provide an outline of the thesis report, while section 6 will provide the reader with a timeline of the scheduled tasks that are to be performed during the thesis project.

2 Theory & Literature

This section of the report aims to deepen the understanding of previously done research in the field of autonomous vehicles and the acceptance of the technology, as well as to define the gaps in the literature. To do so, it first provides a background on both the autonomous vehicles and technology acceptance on a more general level, after which factors that are found to impact user acceptance of self-driving cars in existing literature are listed. These factors will help in answering the first main research question.

First of all, the methods of searching for existing literature are mentioned, after which the relevant topics and definitions are explained. Then, an overview of self-driving cars and their levels of automation is given, as well as the benefits that self-driving cars offer. Next, general models and theories on the user acceptance of new technological innovations are discussed, after which articles specifically referring to the acceptance of autonomous vehicles are discussed. Then, a look is taken at literature that takes into account other stakeholders who are involved in the implementation of self-driving cars, such as the automotive industry and governments. Finally the implications of the findings in this chapter for the research in this paper are discussed.

2.1 Literature Research

The literature discussed in this review has been found by doing a systematic literature research. This started by looking for existing reviews of the literature in order to get a good overview of the contributions made in this field. This resulted in finding a literature review by (Rosenzweig & Bartl, 2015). In this review, articles published between 1989 and October 2015 were reviewed that were found using a systematic keyword search using the search terms “Autonomous driving”, “Self driving car” and “Driverless car”.

The references from this article were also used to find more articles which might prove to be useful for this literature review. On top of that, additional and more recent articles were searched for using the search terms “autonomous vehicle”, “Self-driving car”, “Driverless car”, “user acceptance” in the databases of Scopus, Google Scholar and IEEE Xplore, resulting in several more useful articles, found in the first 2 pages of the search results when sorted on ‘most cited’. No specific journals were used in searching for relevant articles. In most cases, a link to the full text was available through one of the used databases, but for papers where this was not the case, Google was used to search for the full text by searching for the article’s title. References from interesting papers were also used to find more potentially useful papers. Additionally, general background information and news, such as information on the automation levels of self driving cars, was also searched for through Google using varying terms.

2.2 Relevant Topics

The relevant topics for this research are literature on the societal impacts of self-driving cars and literature on user acceptance models of new technological innovations, as well as literature on the interaction of other stakeholders with new technologies. Literature on societal impacts is relevant in order to gain a good overview of the potential factors that could influence user acceptance specifically in the case of autonomous vehicles, while literature on user acceptance models for new technological innovations could provide more generally applicable concepts that influence the successful introduction of new technologies. Literature on the interaction of other stakeholders helps understand how these stakeholders, such as governments or manufacturers, deal with issues such as user acceptance when bringing new technologies to the market.

By getting a good overview of these existing models and the influencing factors that have already been found, it is possible to identify shortcomings in the literature and areas that require further attention. In this literature search, the focus mainly lies on finding the factors that play a role in the user acceptance of autonomous vehicles, as this will be helpful in setting up the right methodology for this research project. By knowing most of the factors that play a role beforehand, it becomes easier to focus on the underlying reasonings for these factors, instead of having to look whether they play a role at all.

2.3 Definitions

In this section, definitions are given for the term User Acceptance and factors that influence it, as well as the term Autonomous Vehicles. The way levels of automation are defined according to the Society of Automotive Engineers (SAE) is clarified as well.

2.3.1 User Acceptance & Influencing Factors

User acceptance is a complex construct that consists of many factors that play a role in it. Dillon and Morris (1996) define user acceptance in the context of information technology as the demonstrable willingness within a user group to employ a technology for the tasks it is designed to support. Davis (1985) states that two other constructs, namely perceived usefulness and perceived ease of use, affect user acceptance of technologies. This research will try to identify similar constructs, which will be referred to as factors, that influence the user acceptance of self-driving cars defined according to the definition of Dillon and Morris (1996).

It is also important to make a distinction between two types of acceptance, referred to as *consumer acceptance* and *citizen acceptance* by Huijts et al. (2012). The first refers to the willingness to use the

technology itself, while the latter refers to the placement of the technology in one's environment. Since these two forms of acceptance influence each other and cannot completely be seen as separate issues, both are seen as part of the term user acceptance used in this research. Since this paper will mostly address people with a driver's license however, and since it is assumed that it will play a larger role in the success of the technology, a larger emphasis is placed on *consumer acceptance*.

2.3.2 Autonomous Vehicles

Antsaklis, Passino, and Wang (1991) define the word autonomous as having the power for self-government. They further state that autonomous control systems are designed to perform well under significant uncertainties in the system and environment for extended periods of time, and that autonomous control systems must be able to compensate for significant system failures without external intervention. When this definition is applied to autonomous vehicles, also known as autonomous cars, self-driving cars or driverless cars, it becomes clear that the car has to be able to drive itself without intervention from the driver regardless of the circumstances. Wood, Chang, Healy, and Wood (2012) mention that although their article generally uses the term "autonomous" instead of "automated", despite the fact that the latter term is perhaps more accurate. The reason for this is that the term "autonomous" is currently in more widespread use and therefore also more familiar to the general public. The authors argue that the term "automated" refers to control by a machine, while "autonomous" refers to acting alone or independently. In this article, the term "autonomous" will also be used despite its inaccuracy, for reasons of familiarity with the term. The SAE refers to "automated" vehicles and has identified several levels of automation, which will be discussed in the next subsection.

2.3.3 Levels of Automation

The Society of Automotive Engineers has defined the levels of driving automation in an international standard J3016. This standard is widely accepted in the industry, and has even been incorporated in the federal policy (NHTSA, 2016) of the US National Highway Traffic Safety Administration, also known as NHTSA.

The most important distinction between the levels of automation is the step from SAE Level 2 to 3, which separates Human Driver Systems from Automated Driving Systems, as can be seen in Figure 2-1. This paper focuses only on the type of cars that are labeled by the SAE as Automated Driving Systems, as user acceptance is expected to be a significantly larger barrier for these vehicles.

| SAE level | Name | Narrative Definition | Execution of Steering and Acceleration/Deceleration | Monitoring of Driving Environment | Fallback Performance of Dynamic Driving Task | System Capability (Driving Modes) |
|---|-------------------------------|--|---|-----------------------------------|--|-----------------------------------|
| Human driver monitors the driving environment | | | | | | |
| 0 | No Automation | the full-time performance by the <i>human driver</i> of all aspects of the <i>dynamic driving task</i> , even when enhanced by warning or intervention systems | Human driver | Human driver | Human driver | n/a |
| 1 | Driver Assistance | the <i>driving mode</i> -specific execution by a driver assistance system of either steering or acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i> | Human driver and system | Human driver | Human driver | Some driving modes |
| 2 | Partial Automation | the <i>driving mode</i> -specific execution by one or more driver assistance systems of both steering and acceleration/deceleration using information about the driving environment and with the expectation that the <i>human driver</i> perform all remaining aspects of the <i>dynamic driving task</i> | System | Human driver | Human driver | Some driving modes |
| Automated driving system ("system") monitors the driving environment | | | | | | |
| 3 | Conditional Automation | the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> with the expectation that the <i>human driver</i> will respond appropriately to a <i>request to intervene</i> | System | System | Human driver | Some driving modes |
| 4 | High Automation | the <i>driving mode</i> -specific performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> , even if a <i>human driver</i> does not respond appropriately to a <i>request to intervene</i> | System | System | System | Some driving modes |
| 5 | Full Automation | the full-time performance by an <i>automated driving system</i> of all aspects of the <i>dynamic driving task</i> under all roadway and environmental conditions that can be managed by a <i>human driver</i> | System | System | System | All driving modes |

Figure 2-1 Summary table of levels of driving automation according to SAE standard J3016

2.4 Motives for Automation

The pace of development of autonomous vehicles has significantly accelerated in recent years, partially because it is becoming technically more feasible, but also because literature has identified many significant benefits that the technology could offer society.

One of the clearest benefits that self-driving cars could provide is an improvement of traffic safety, which could not only save lives, but also be economically advantageous. More than 1.2 million people die in traffic accidents every year. In the Netherlands alone, 621 died in traffic accidents in 2015 (CBS, 2016), and the cost of traffic accidents in 2009 was reported to be 12,5 billion euro, roughly 2,2 percent of the country's Gross Domestic Product (GDP) (SWOV, 2014). In the United States, vehicle crashes are the leading cause of death for Americans between the ages of 4 and 34, and 93 percent of the 6 million crashes in the US could be attributed to human error (Silberg & Wallace, 2012).

Safety is just one of the many benefits that self-driving cars offer. Another example are the significant improvements in fuel economy that can be achieved by using autonomous vehicles. This is not only the case because these cars can more effectively tune their acceleration and deceleration profiles in order to reduce the amount of fuel wasted (Urmson & Whittaker, 2008, p. 66), but also by taking advantage of the enhanced capabilities of the cars to drive closer to each other, enabling the phenomenon called 'platooning'. By taking advantage of platooning, fuel economy is further reduced as a result of lower air resistance, while traffic flow and highway capacity are also improved (Le Vine, Zolfaghari, & Polak, 2015; Luettel et al., 2012; Payre et al., 2014).

Self-driving cars could also provide better mobility for people who are currently unable to drive cars themselves, or do not always have someone available to drive for them. Examples of this are people who are unable to drive due to disability, people who have lost driving privileges due to age, or people who are simply still too young to drive (Urmson & Whittaker, 2008). On top of that, it could be beneficial to people who do have a driver's license, but are under the influence of alcohol or other substances.

Another big factor is the factor of reduced driver stress (Litman, 2016). Having the car drive itself could allow people to rest or work while traveling, instead of requiring them to focus on the road. As a result, traveling, especially long distances, by car could be seen as much less of an issue as the driver could just bring entertain him or herself during the trip, or do something productive, meaning that the traveling time does not have to be seen as inefficient.

Autonomous vehicles also make it much easier to share cars, as they can easily move between places to pick people up. Today, cars are usually used only for a small part of each day, while remaining idle parked for hours on end (Alessandrini, Campagna, Site, Filippi, & Persia, 2013). Silberg and Wallace (2012, p. 7) state that cars sit unused for almost 22 hours every day on average. Larry Burns, the director of the Program on Sustainable Mobility at the Earth Institute of Columbia University, New York City, stated that only 15 percent of the amount of vehicles currently on the roads was required in Ann Arbor, if car sharing

was efficiently implemented. (Litman, 2016) argues that self-driving taxi's would be a cost effective alternative for people who drive less than 5000 miles a year, but that many motorists are likely to prefer personal vehicles because of prestige and convenience. Although some people value certain benefits more than others, there is a pretty strong consensus about the benefits that self-driving cars will provide to society.

2.5 User Acceptance of New Technological Innovations

Despite the benefits mentioned in the previous section, user acceptance of autonomous vehicles is not something that can simply be taken for granted, as there are still many reasons that might prevent people from wanting to use the technology. Since it could be argued that self-driving cars have an overall positive impact on society, being able to accurately assess what contributes to acceptance of the technology can therefore be considered very valuable for both governmental institutions and the automotive industry, especially since history has proven that this can often be very difficult. The fact that technology acceptance is such a complex issue becomes clear when looking at some examples, such as the Google Glass, which failed to become a success thus far (Kernaghan, 2016), or the Personal Computer (PC), which did become hugely successful contrary to many people's expectations

This section will address literature on the acceptance of technologies in general, which factors play a role and how they can be influenced, after which the next section will look at autonomous vehicles specifically.

2.5.1 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) was introduced by Davis (1985). This model states that the attitude of a potential user towards a given system largely determines whether or not that person will actually use it, and that the attitude toward using is a function of two factors; *perceived usefulness* and *perceived ease of use*. On top of that, the *perceived ease of use* also has a causal effect on *perceived usefulness*. The model can be expressed in the four equations below:

$$EOU = \sum_{i=1}^n \beta_i X_i + \varepsilon \quad (1)$$

$$USEF = \sum_{i=1}^n \beta_i X_i + \beta_{n+1} EOU + \varepsilon \quad (2)$$

$$ATT = \beta_1 EOU + \beta_2 USEF + \varepsilon \quad (3)$$

$$USE = \beta_1 ATT + \varepsilon \quad (4)$$

Where:

X_i = Design feature i , $i = 1, n$

USEF = Perceived usefulness

USE = Actual use of the system

ε = random error term

EOU = Perceived Ease Of Use

ATT = Attitude toward using

β_i = Standardized partial regression coefficient

A visual representation of this model is shown in Figure 2-2.

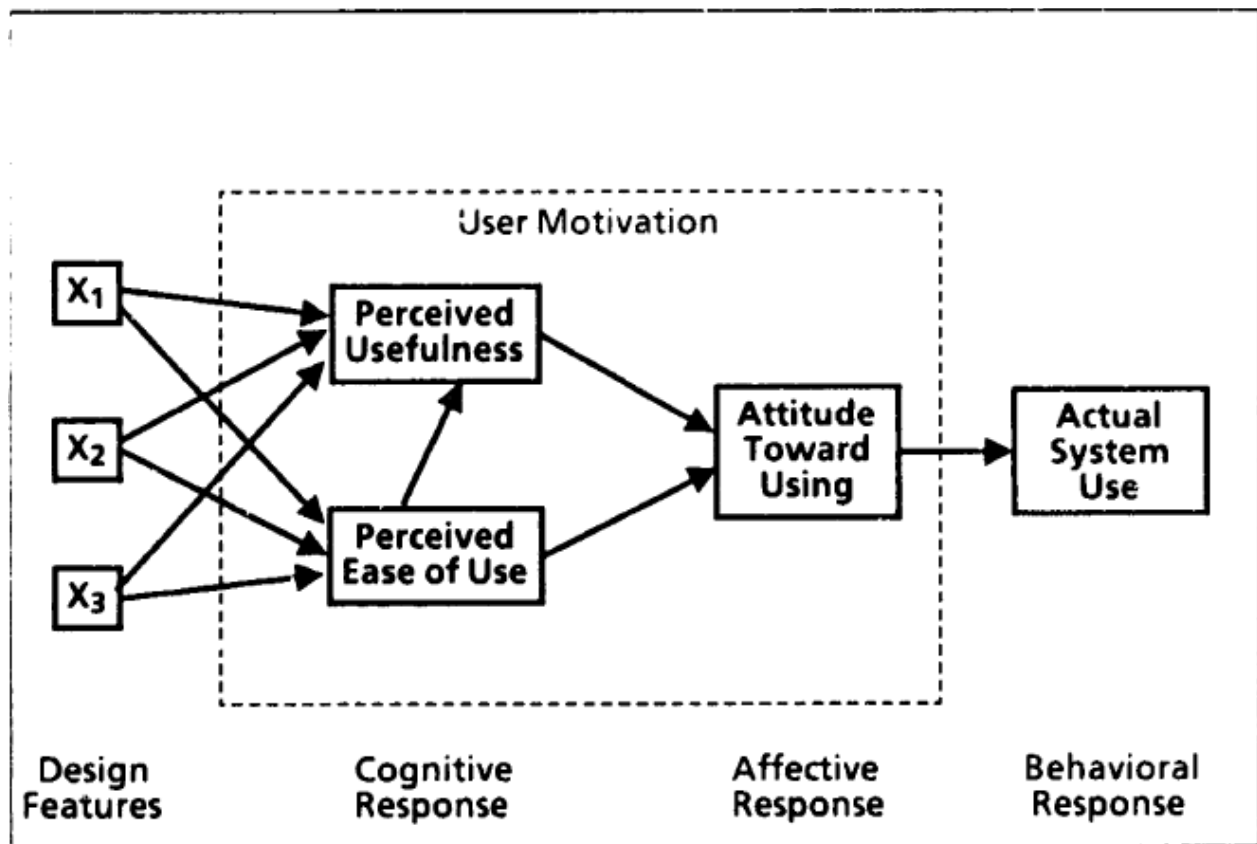


Figure 2-2 Visual representation of the Technology Acceptance Model. (Davis, 1985)

Davis' Technology Acceptance Model was originally developed in order to improve the understanding of user acceptance of computer-based information systems, but has laid the foundation for many adaptations of the model, used in other areas of research. An example of this is the work of Choi and Ji (2015), who extend the model in order to examine user adoption of self-driving cars. This model is valuable for this research, as it shows a good baseline model for explaining the phenomenon of user acceptance. When looking for explanations as to why certain factors play a role, it is helpful to see that this might often simply be explained by the perceived usefulness and the perceived ease of use.

2.5.2 Technology Acceptance Framework

The Technology Acceptance Framework of (Huijts et al., 2012) is a framework that uses psychological factors in order to create a framework for the acceptance of new energy technologies. Although developed with sustainable energy technologies in mind, the authors state that the framework may also be used as a framework for studying the acceptance of other technologies with social or environmental benefits and potential risks or costs. The authors take a summary of the theory of planned behavior which is modified for technology acceptance as a starting point, and adapt it by adding additional influencing factors. Figure 2-3 depicts a schematic representation of the framework as a whole. The figure shows that the perception people have of the technology plays a large role, even if it might differ from reality. Huijts et al. (2012, p. 528) note that these perceptions of costs, benefits and risks are influenced by trust in the actors responsible for the technology, and that these perceptions shape the attitude of the public towards the technology. The paper distinguishes two forms of acceptance; *citizen acceptance* and *consumer acceptance*. The first form refers to the reaction of the public to placement of the technology in their environment, while the second form refers to the public's response in terms of purchasing and using the technology. The framework also shows that the *problem perception*, and whether people feel like they can do something about it (*outcome efficacy*) play a role, as well as social influence (*social norm*). This paper is especially interesting for this research as it shows many links between the mentioned factors, which might help in looking for underlying reasons explaining the importance of factors that will be found in this research.

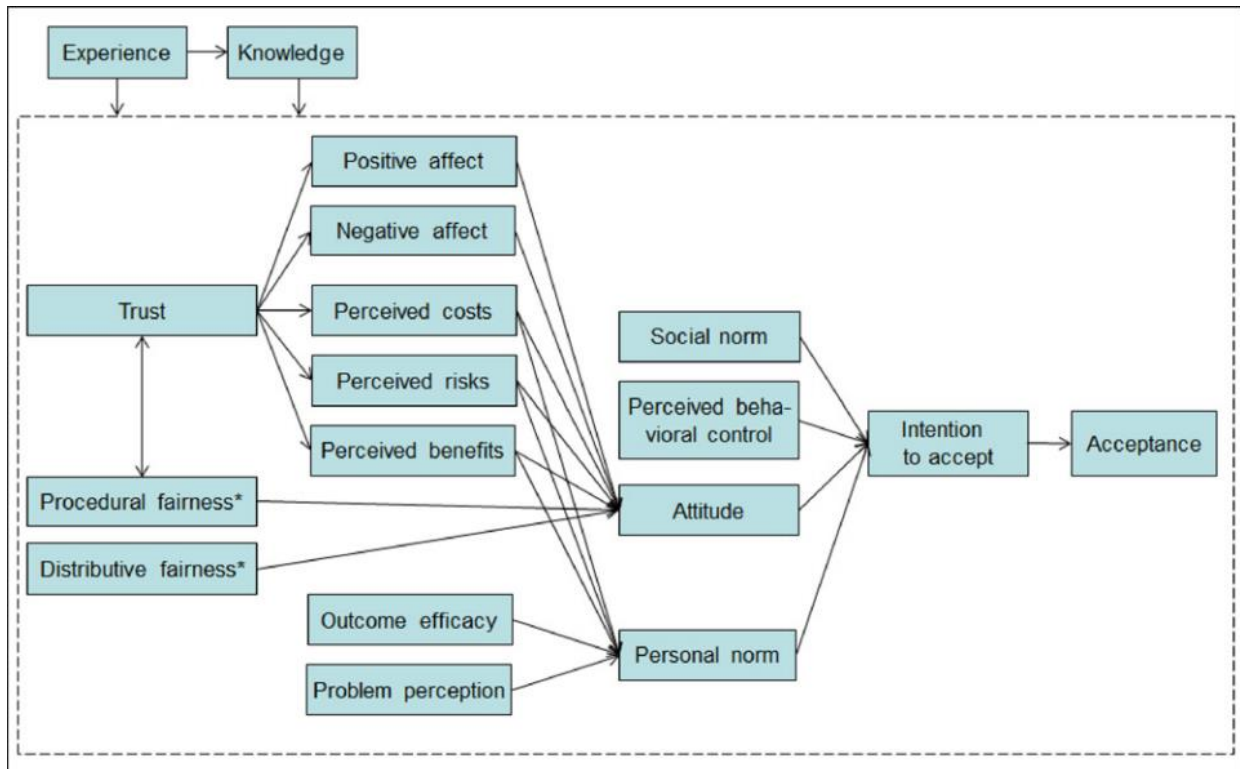


Figure 2-3 A schematic representation of the technology acceptance framework. (Huijts et al., 2012)

2.5.3 Unified Theory of Acceptance and Technology Use (UTAUT)

The Unified Theory of Acceptance and Technology Use (UTAUT) was developed by Venkatesh, Morris, Davis, and Davis (2003) in an attempt to improve on existing information technology (IT) acceptance models. Where the eight existing models managed to explain 17 to 53 percent of the variance in user intention to use IT, the UTAUT model, unifying these eight models, managed to outperform existing models by explaining 70 percent of the variance. The eight models used in developing the UTAUT model and their core constructs are listed in Table 2-1. As can be seen, the Technology Acceptance Model discussed in section 2.5.1 was also included. The results of an empirical comparison of the eight models were used to determine which of the constructs had a significant impact on the intention of usage. Based on these results, Venkatesh et al. (2003) theorized that there are four constructs which are significantly important direct determinants of user acceptance: *performance expectancy*, *effort expectancy*, *social influence* and *facilitating conditions*, which are impacted by four key moderators: *Gender*, *age*, *voluntariness* and *experience*. A visual representation of this model can be found in Figure 2-4.

Table 2-1 Models and Theories of Individual Acceptance (Shortened version of Table 1 in Venkatesh et al. (2003))

| Model | Core constructs |
|--|------------------------------------|
| Theory of Reasoned Action (TRA) | Attitude Toward Behavior |
| | Subjective Norm |
| Technology Acceptance Model (TAM) | Perceived Usefulness |
| | Perceived Ease of Use |
| | Subjective Norm |
| Motivational Model (MM) | Extrinsic Motivation |
| | Intrinsic Motivation |
| Theory of Planned Behavior (TPB) | Attitude Toward Behavior |
| | Subjective Norm |
| Combined TAM and TPB (C-TAM-TPB) | Attitude Toward Behavior |
| | Subjective Norm |
| | Perceived Behavioral Control |
| | Perceived Usefulness |
| Model of PC Utilization (MPCU) | Job-fit |
| | Complexity |
| | Long-term Consequences |
| | Affect Towards Use |
| | Social Factors |
| | Facilitating Conditions |
| Innovation Diffusion Theory (IDT) | Relative Advantage |
| | Ease of Use |
| | Image |
| | Visibility |
| | Compatibility |
| | Results Demonstrability |
| | Voluntariness of Use |
| Social Cognitive Theory | Outcome Expectations – Performance |
| | Outcome Expectations – Personal |
| | Self-efficacy |
| | Affect |
| | Anxiety |

Nordhoff et al. (2016) applied the UTAUT in the context of self-driving cars and combined it with other theories in order to come to a conceptual model on acceptance. Similarly to the Technology Acceptance Framework discussed in Section 2.5.2, this paper distinguishes between individual and societal acceptance, while it also addresses differences between acceptance before, during, and after experiencing autonomous vehicles (Nordhoff et al., 2016, p. 5). Although the authors state the model

may possibly be skewed towards vehicle users that have not tested driverless vehicles (Nordhoff et al., 2016, p. 14), the model proposed still proves to be valuable for this research. Since this research looks into the reasonings and the underlying reasons for the importance of several factors, this model gives a good first indication of why certain factors may play a role. On top of that, it shows the effects of several moderating factors, such as gender and age, which will be controlled in this research in order to increase the validity of the results found.

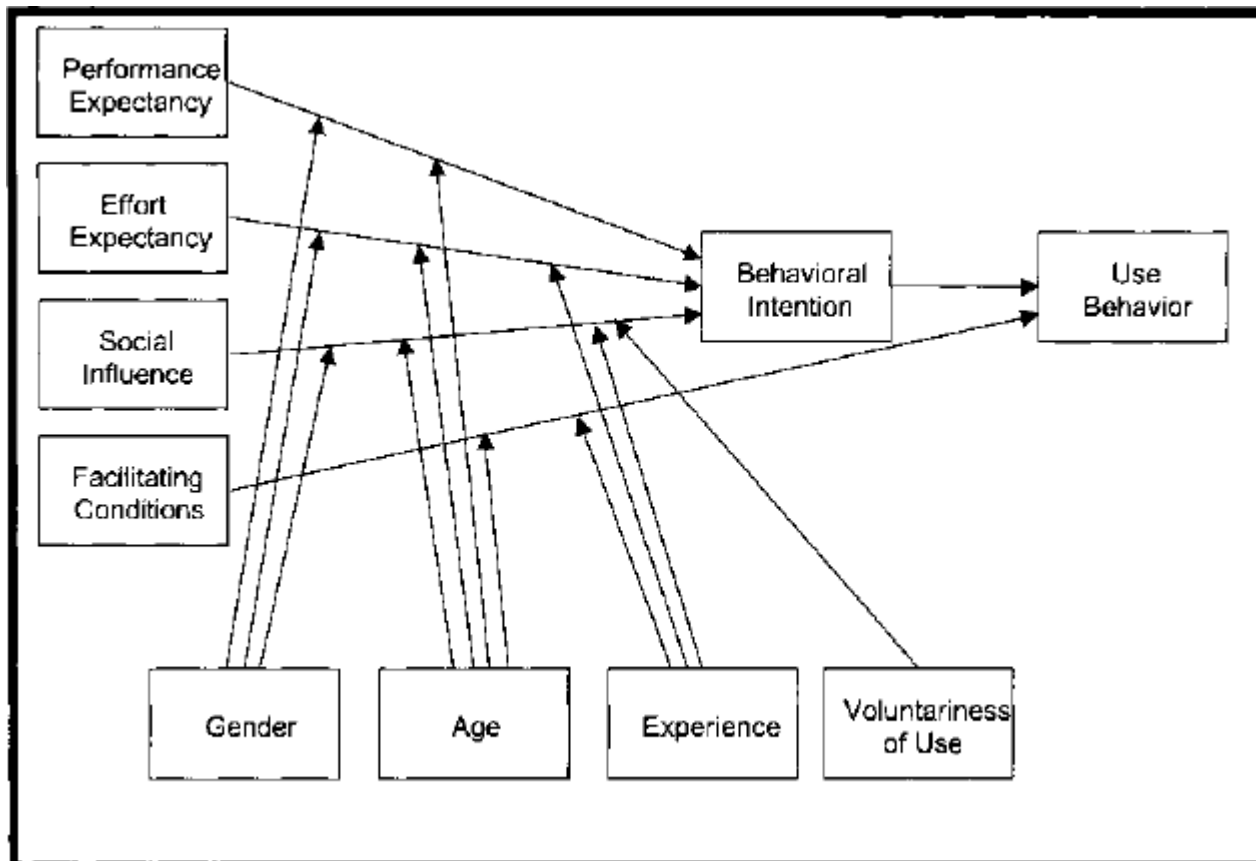


Figure 2-4 Visual representation of the Unified Theory of Acceptance and Technology Use (UTAUT) (Venkatesh et al., 2003)

2.5.4 Relevance of models for proposed research

The models shown here provide a good understanding of the existing models for explaining user acceptance. By looking at the factors that play a role in the user acceptance of new technologies and the links between them, it becomes easier to recognize these links in the research proposed in this paper. For example, by knowing beforehand that the perceived risks of the technology might be affected by someone's trust in the technology, as suggested in the Technology Acceptance Framework by (Huijts et al., 2012), one can take this into consideration when asking interview candidates about the safety aspect of self-driving cars.

Looking into the existing models also helps in finding factors that need to be controlled for, such as age and gender, in order to improve the validity of this work. Understanding these models also helps in understanding the specific factors influencing the acceptance of autonomous vehicles, as shown in the next section. Since these papers might mention some of the found factors through surveys and do not provide any underlying reasonings, it might be possible to extract some connections by trying to fit these results into the existing acceptance models.

2.6 Acceptance of Autonomous Vehicles

Most of the models for assessing technology acceptance in the previous section were introduced in order to get a better overview of the acceptance of IT applications, meaning that the models may not be applicable in the case of autonomous vehicles. Many articles in the existing literature have however taken these models as a starting point, and have adapted these models to suit self-driving cars.

An example of this is the work done by Choi and Ji (2015), who combined the Technology Acceptance Model with prior research on trust in automation. The result of this is the research model shown in Figure 2-5, which identifies 10 constructs that significantly affect acceptance. Nees (2016) seems to use already extended versions of the Technology Acceptance Model in order to set up a 24-item measurement scale called the Self-driving Car Acceptance Scale (SCAS), which is then used to assess acceptance. Payre et al. (2014) also mention the Technology Acceptance Model, and extend the model to include other constructs, while Nordhoff et al. (2016) use the Unified Theory of Acceptance and Technology Use in their work.

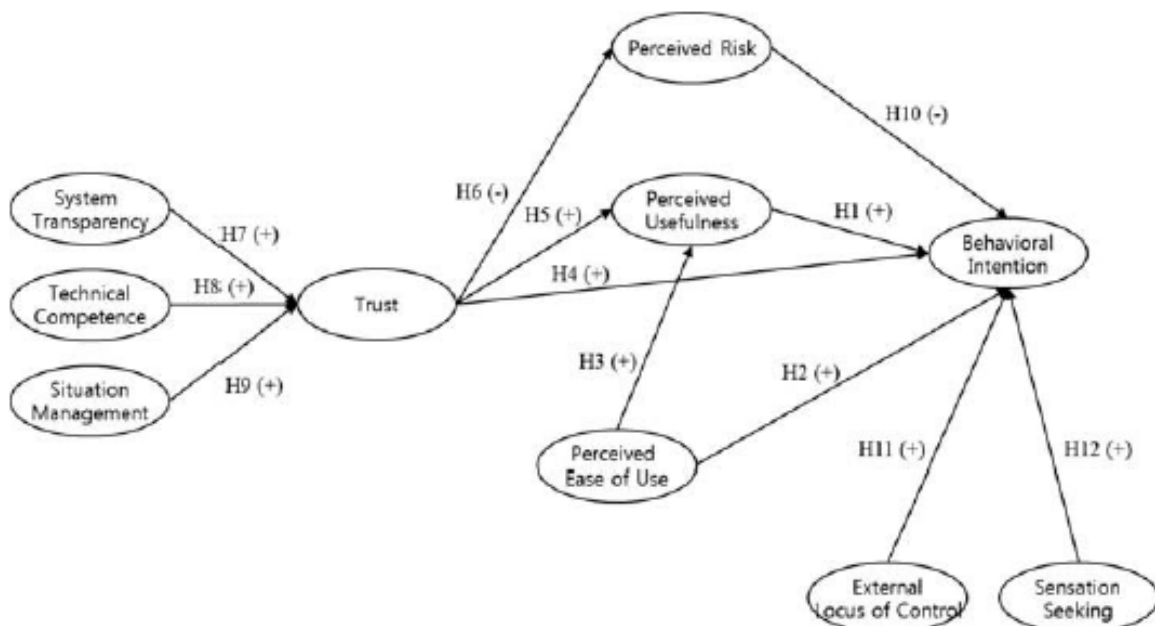


Figure 2-5 The research model proposed by Choi and Ji (2015).

While these articles have had moderate success in explaining the variance in user acceptance and have identified many factors that play a role, it is essentially unanimously agreed upon that not all relevant variables have been identified and that further research is required. Choi and Ji (2015, p. 695) for example state that constructs such as personality characteristics, which are not included in their model, are likely to be valuable additions, while Nees (2016, p. 1452) argues that a closer look should be taken at age and driving experience, and that the results show that yet-to-be-determined factors will account for most of the variance in the acceptance of self-driving cars. Payre et al. (2014, pp. 259, 260) note that pleasure of driving and the participants' interest in the technology should be included in future research, but also that one of their included factors, external driving locus of control, had no significant correlation to the acceptance of self-driving cars. Nordhoff et al. (2016, p. 14) agree with the notion that determinants of user acceptance of autonomous vehicles are largely unknown, and state that the involvement of all users is important in the acceptance and therefore success of self-driving cars.

Since the existing literature agrees that many factors are still unknown, it may be helpful to first summarize all the factors that have been already been identified. Table 2-2 shows these factors and the recommendations made for future research in the existing literature. Many of the factors identified in this table, have been found through surveys. This means that not much is clear about the underlying reasons why certain factors play a role. Since this report argues for the importance of a deeper understanding of these factors, some of the future research areas recommended such as the flow model of Csíkszentmihályi (1991) are not addressed. Instead, through using interviews, it is attempted to add to the list of current factors found by discovering why these factors play a role. By doing so, it automatically becomes easier to investigate the strategic implications for key players in public transport and the auto industry, a recommendation for future research made by Nordhoff et al. (2016). By doing interviews and using open questioning to ask interview candidates about the factors that play a role in their acceptance, one does not only find out whether the factor is mentioned in a positive or a negative context, but also whether people are actually aware of many of the factors. On top of that, the factors found can also be seen as confirmation for previously done research.

Table 2-2 Overview of identified factors and future recommendations in existing literature

| Author | Title | Factors found | Key gaps / recommendations for future research |
|-------------------|---|---|---|
| (Nees, 2016) | Acceptance of Self-driving Cars: An Examination of Idealized versus Realistic Portrayals with a Self-driving Car Acceptance Scale | <ul style="list-style-type: none"> – Perceived reliability/trust – Cost – Appropriateness of automation/compatibility – Enjoyment of to-be-automated task – Perceived usefulness of automation – Perceived ease of use of automation – Experience with automation – Intention to use automation – Exposure to articles | More research needed on age, driving experience and impact of Idealized portrayals |
| (Choi & Ji, 2015) | Investigating the Importance of Trust on Adopting an Autonomous Vehicle | <ul style="list-style-type: none"> – System transparency – Technical competence – Situation management – Trust – Perceived usefulness – Perceived risk – Perceived ease of use – Sensation seeking – External locus of control – Behavioral intention | Personality characteristics should be included in future models |
| (Bjørner, 2015) | A Priori User Acceptance and the Perceived Driving Pleasure in Semi-autonomous and Autonomous Vehicles | <ul style="list-style-type: none"> – Driving pleasure – Perceived usefulness – Perceived ease of use – Culture – Age – Gender – Personal traits – Setting – Difficulty – Task – Risk | It may be worth looking into positive psychology and the flow model of (Csíkszentmihályi, 1991) |

| | | | |
|-------------------------|--|---|--|
| | | <ul style="list-style-type: none"> – Pre-existing knowledge – System performance | |
| (Payre et al., 2014) | Intention to use a fully automated car: Attitudes and a priori acceptability | <ul style="list-style-type: none"> – Intention to use – Intention to buy – Willingness-to-pay – Gender – Age – Interest in impaired driving – Contextual acceptability – Driving related sensation seeking (DRSS) – Attitude – Driving externality (no effect found) – Driving internality | Interest of participants in technology should be taken into consideration in future research. |
| (Nordhoff et al., 2016) | A Conceptual Model to Explain, Predict, and Improve User Acceptance of Driverless Vehicles | <ul style="list-style-type: none"> – Socio-Demographics – Mobility Characteristics – Vehicle Characteristics – Contextual Characteristics – Locus of Control – Sensation Seeking – Trust – Performance Expectancy – Effort Expectancy – Social Influence – Pleasure – Arousal – Dominance – Efficiency – Effectiveness – Equity – Satisfaction – Usefulness – Willingness to Pay – Social Acceptability – Behavioral Intention | Involve users who will not only use, but also decide on and operate autonomous vehicles. Investigate strategic implications for key players in public transport and the auto industry. |

2.7 Role of other Stakeholders

The models for assessing technology acceptance presented in the previous sections prove that technology acceptance is a complex matter. This is no different in the case of self-driving cars, as there is evidence to suggest that many people are skeptical of the technology, and that many people are unwilling to hand over control to a computer (Quain, 2016). While most of the models discussed look at the acceptance of potential users of the technology, other stakeholders such as the national government, legislators and car manufacturers should also be included. Nordhoff et al. (2016, p. 14) state that it is important to incorporate the perspectives and expectations of other stakeholders that potentially play a role in using, operating, or deciding on the implementation of self-driving cars, and that this is an area that currently receives inadequate attention.

The introduction of autonomous vehicles can provide many societal benefits from which national governments could benefit, as discussed in section 2.4. It is therefore in the best interest of the government and the legislators to stimulate the technology in reaching the market. This could be done by implementing things such as intelligent infrastructure and by assisting automotive companies in their R&D efforts, but also by mitigating public concerns through legislative changes. If many people for example are uncomfortable with the idea of giving away full control of the vehicle, the government could enforce car manufacturers to allow the driver to make the final control decision (A. M. Khan, Bacchus, & Erwin, 2012). The introduction of the technology will likely also create new unforeseen situations, to which the government will have to respond. If pedestrians know that self-driving cars will stop anyway, this might change their behavior when crossing a street for example. Most of this will however largely depend of the level of automation and the market situation (A. M. Khan et al., 2012, p. 88).

Currently, it appears to be the case that most of the advances made are instigated by the technology developers, which suggests that there is little evidence of a true market demand for autonomous vehicles at the moment (A. Khan, 2017). Automotive companies will therefore have to carefully manage the expectations that come along with the introduction of autonomous vehicles, as having too high expectations of the technology before using the technology could negatively impact the trust in the technology (Beggiato & Krems, 2013), which could further reduce the demand for the technology. On top of that, car manufacturers will have to interact with all stakeholders in order to identify important values, so that they can be adequately incorporated in the technology. This often proves to be a difficult task, as the majority does not necessarily rule when designing for values, since the opinion of minorities may include relevant values (Taebi, Correljé, Cuppen, Dignum, & Pesch, 2014). Having a good overview of the wants and needs of potential users can be very valuable however, as it could help manufacturers in targeting a specific audience in their marketing efforts. Since self-driving cars are expected to be expensive in the early stages, the technology is likely to only feature in expensive car models, which are often bought by people for driving pleasure. Therefore, knowing which factors might lead to lower or higher acceptance of self-driving cars could prevent targeting the wrong people, and make it easier to target early adopters and technology enthusiasts.

2.8 Chapter Implications

In this chapter, the literature on technology acceptance and acceptance of autonomous vehicles is synthesized in order to get a good overview of the problem as a whole, which is used to identify the issues and gaps in the literature that will be addressed in this research.

Section 2.5 shows the important existing technology acceptance frameworks and discusses the relevance of these models for the research proposed in this thesis project. As also mentioned in section 2.6, it is clear that not all variables influencing the acceptance of autonomous vehicles have been found. On top of that, a gap in existing literature is that results vary between research projects and that there is little argumentation supporting the inclusion of several factors, making it difficult for the companies and the government to come to a well-argued plan of action based on these findings. This research is therefore explorative in nature, as it will allow for the identification of additional factors on top of the ones already identified, as well as given reasoning behind the inclusion of certain factors.

A second gap found in the literature is that the focus mainly lies on direct interaction between the technology and potential users, while the role of other stakeholders is largely overlooked (Nordhoff et al., 2016, p. 14)

These findings are used in setting up the research design and methodology in the next chapter, in order to make sure that the research makes a valuable contribution to the field.

3 Research methodology

In this section of the report, the research design and methodology used will be elaborated upon. First, section 3.1 will discuss the way in which data is collected, after which section 3.2 will discuss how the collected data will be analyzed in order to come to results. Afterwards, the chapter implications will be discussed.

3.1 Data collection

Data was collected over a time period of approximately two months during this research project in two separate rounds. In both rounds, interviews were used to collect the data, but different target audiences were addressed. The data collected in the first round of interviews was required for answering the first research question as well as the second research question. The interviews with experts conducted afterwards were used to validate the findings from the first round of interviews and the answers given on both research questions based on those results.

3.1.1 Interviews

In the first part of this research, 30 to 40 short interviews, lasting approximately 15 minutes, will be conducted. Since getting a representative sample of the entire population would require a much larger sample size, which is impractical mainly due to time constraints, this thesis research focuses specifically on a younger audience. This group of people is deemed to be more interesting, as they are more likely to have an interest in self-driving cars and to have developed a mental model of the technology for themselves. Another reason why this target group is selected is the fact that younger people are more likely to come in contact with self-driving cars in the future, as the technology might still take some time to mature.

The Unified Theory of Acceptance and Technology Use (UTAUT) discussed in section 2.5.3 identifies four moderators; age, gender, experience and voluntariness of use, that need to be taken into account when it comes to technology acceptance. In this research, age will be controlled by only selecting candidates between the ages of 18 and 40, while gender is controlled by aiming for a 50/50 gender distribution. Voluntariness of use will be controlled by making it clear to the candidates that the use of the technology is completely voluntary, and experience will be moderated by only selecting candidates who are in possession of a driver's license, but have not driven an autonomous vehicle before. People in possession of a driver's license are chosen as they represent a much larger percentage of the population, and because they are likely to have different reasons for accepting a self-driving car than people who do not

have a driver's license. Although both groups could be interesting interview candidates, only one is selected for practical reasons. Most of the candidates will be students of the Management of Technology program at the Delft University of Technology, which is where this research is conducted. Although the students have a very international character, and despite the fact that not all candidates will be from Delft, this might skew the results, as these candidates are all likely to be more interested in the technology than the average person.

The reason why interviews are chosen as the method for answering both research questions is because most, if not all, existing literature that aims to find the factors leading to user acceptance seem to do so by making use of surveys and questionnaires, which suggests that most authors aim for breadth and generalization, rather than depth and specificity (Doorewaard & Verschuren, 2010). As a result, many of the existing research finds some of the factors that play a role, but does not explain why they do so. An example of this is Nees (2016), who argues that age has a negative correlation with acceptance, although it seems likely that other underlying reasons are the cause for this negative correlation.

Because of the explorative nature of searching for unidentified factors that play a role, the interview questions have been constructed to be open-ended using the interview guidelines by Jacob and Furgerson (2012), so that candidates are encouraged to come up with influencing factors on their own, rather than being given a list of factors such as the one found in Table 2-2 upfront. This is to prevent factors mentioned by the interviewer from invoking a bias in the candidates mind, which is crucial, as people who have not yet created a clear mental model of self-driving cars could be strongly influenced by the interviewer. An example of this is the work by Payre et al. (2014), which explained 25% of the variance in acceptance by the interest in impaired driving, while this factor has not played a prominent role in other literature. Nees (2016) notes that although impaired driving might play a prominent role, the result could also have emerged due to idiosyncrasies in the questionnaire, which may have invoked a bias in the responses of the users. Instead, a table including previously found factors will be given to all candidates at the end of the interviews, so that this will not influence the responses given to the open questions. Candidates are asked to rank the 5 most important factors in the table, which creates a better view of the importance of factors not mentioned in the interview. The results from this table can then be used to confirm the results found in the open questions, and to check whether people might have overlooked factors they might consider important during the open questioning, indicating a lack of awareness of this factor. Candidates were not asked specifically whether their opinion changed, or whether they were unaware of certain factors, after being shown the table, however. Based on the factors given by interview candidates and their responses in the table given at the end, an answer can be found to the first research question:

Which factors and their underlying reasons play a role in the user acceptance of self-driving cars?

Furthermore, candidates are also asked their opinion on the actions that the national government and car manufacturers should undertake in order to successfully introduce the technology to the market.

Based on the responses given to these questions and the answer found to the first research question, an answer can be given to the second research question:

What are the implications of improved knowledge on user acceptance for the automotive industry and governments?

The answer given to this question will consist of suggestions made by the interview candidates, which follow directly from the interview, as well as conclusions that can be drawn based on the answers found to the first research question.

Two pilot interviews are also done in order to test and improve the interview script, after which faults and imperfections in the protocol will be improved upon. Depending on the magnitude of the changes, it will then be determined whether the data collected during the pilot interviews might still be valuable.

3.1.2 Interviews with experts

A second, smaller part of the research will consist of another round of interviews which will take place in a different form. After the first round of interviews has been completed, and conclusions have been drawn based on the results, the findings will be presented to 4 experts in the field. After a short introduction, the influencing factors that have been found will be presented, after which a number of implications for the national government and the automotive industry that follow from these results will be presented. The experts are then asked to give their opinion on these implications, and whether they agree with these implications or not. On top of that, experts are asked to come up with their own possible implications based on the results that have been presented to them, and to reflect on what is currently already being done by these actors. The results of these interviews with experts are then used to validate the results found in the first round of interviews, and the answers that have been given to both research questions based on those results. The interviews will take approximately 30 minutes, of which the first 10 minutes will approximately be used to present the expert with the findings of this research.

3.2 Data analysis

3.2.1 Interviews

The interviews are recorded with a smartphone, after which the audio recordings are transferred to a pc, where they are used in order to create a short summary of the responses, which captures the essence of what was said during the interview. These factors mentioned in the interviews are then used to code the interviews using Microsoft Excel. The importance of these factors can then be derived from the amount

of the candidates that have mentioned a specific factor. On top of that, interesting aspects of the technology mentioned only once or sparsely will be discussed separately, as they might pinpoint influencing factors that have not been taken into consideration previously. Despite the fact that these factors aren't mentioned frequently, as candidates may not have given them much thought before, they could still play a large role in the acceptance of self-driving cars subconsciously, meaning that they need to be taken seriously in the analysis of the responses. Finally, the results from the table given to each candidate at the end of the interview can be analyzed and compared to the interview results as well.

3.2.2 Interviews with experts

Similarly to the first round of interviews, the interviews with experts will be fully recorded using a smartphone. While notes will be taken in the meantime, the recording can be used to do so more in depth at a later time, so that all valuable information is collected. Based on this recording, the main findings from these interviews will be summarized, after which this summary is sent back to the candidate for confirmation. This summary will then be used as empirical data afterwards, which is used in order to potentially adjust the findings found in the first round of interviews.

3.3 Chapter implications

In this chapter the methodology for the research conducted in this report has been set up. Based on the gaps found in the literature, data requirements have been made, and data collection methods have been chosen to address these requirements. The factors influencing the user acceptance of self-driving cars will be found through interviews with open-ended questions, after which these results will be used to discuss the implications for both the national government and car manufacturers in a second data collection round, where experts will be interviewed. The results of the methodology presented here are shown in the next section of this report

4 Results

In this section of the report, the results of the interviews will be analyzed. Section 4.1 will elaborate on the identified personal factors in the interviews, after which section 4.2 will do the same for the technological factors. Section 4.3 will then discuss the table given to candidates at the end of the interviews. Finally, section 4.4 will discuss the answers given by the interview candidates regarding the role of the government and the automotive industry.

During the first round of interviews, 35 candidates from 12 different nationalities were interviewed on their acceptance of self-driving cars. The most common nationalities were Dutch (12 candidates) and Italian (6 candidates). Of the 35 candidates, 18 candidates were male and 17 were female. One candidate's driver's license had been expired for one month, and one candidate was to take a driving exam within the next month. These interviews were included in the results nonetheless, as both candidates were deemed to be interested in driving nonetheless, as indicated by their (future) possession of a driver's license. The oldest interview candidate was 34 years old (2 occurrences), while the youngest candidate was 18 years old. The average age of the interviewees was 25,29 years old, with a median of 25 years old. Findings from the two pilot interviews were also included, as the minor changes made did not invalidate the responses given. The results in the table given to candidates at the end were changed however, meaning that only 33 valid responses have been recorded in this part of the interview.

The coding categories that have been identified based on the responses given in the interviews can be seen in Table 4-1. The factors found and the responses given by the interview candidates were categorized into two categories: 'personal factors' and 'technological factors'. Technological factors are split up into 'benefits', 'drawbacks', and 'general' factors, which cannot be clearly seen as a benefit or drawback. The results for each of the identified factors will be presented, together with a number of quotes best representing the beliefs held by the interview candidates. The number of the interview candidate (IC) will be included in the quote, as well as whether the quote has been translated from Dutch or not.

Table 4-1 Coding categories identified during interviews

| Coding category | Subcategory | Code |
|------------------------------------|--|-------|
| General View on Technology (GVOT) | | GVOT0 |
| | Self-perceived knowledge of Technology | GVOT1 |
| Perceived safety (PS0) | | PS0 |
| | Transition period | PS1 |
| | Perceived trust | PS2 |
| Social influences (SI) | | SI0 |
| | Media | SI1 |
| | Word of mouth | SI2 |
| Perceived usefulness (PU) | | PU0 |
| | Ability to spend time on other activities | PU1 |
| | Enhanced mobility for elderly/young/impaired | PU2 |
| | Car sharing | PU3 |
| | Decreased traffic congestion | PU4 |
| | Hunting for parking eliminated | PU5 |
| | Higher speed limits | PU6 |
| Perceived ease of use (PEoU) | | PEoU0 |
| | Comfort with the technology | PEoU1 |
| | Ease of using the technology | PEoU2 |
| Pleasure of driving (PoD) | | PoD0 |
| | Traffic situation | PoD1 |
| | Reason for traveling | PoD2 |
| | Choice between autonomous and human driven | PoD3 |
| Perceived drawbacks (PD) | | PD0 |
| | Ethical issues | PD1 |
| | Price | PD2 |
| | Loss of jobs (taxi/truck drivers) | PD3 |
| | Loss of privacy | PD4 |
| | Security issues | PD5 |
| Role of National Government (RoNG) | | RoNG0 |
| Role of Manufacturers (RoM) | | RoM0 |

4.1 Personal factors

First, a look will be taken into the personal factors that influence the acceptance of self-driving cars and the extent to which the role of these factors differs between people based on their personality characteristics. While some of the benefits and drawbacks of the technology discussed in the next section also differ per person, they are seen as characteristics of the technology in the first place. Similarly, some of the factors discussed here can also be seen as drawbacks or benefits, depending on the persons point of view.

As can be seen in Table 2-2, Payre et al. (2014) suggest that the interest of participants in technology should be taken into consideration in future research. Since a large number of the interviewed candidates are students at a technical university, their interest in technology is likely relatively high. The interest of candidates in this technology specifically was also addressed by asking people about their general view of the technology. Age is also mentioned as a factor (Bjørner, 2015; Payre et al., 2014), and by interviewing a young audience the results found here might give a better image of this group, so that it can later be compared with different age groups in future research.

On top of that, the importance of some factors that have already been identified, such as perceived reliability/trust (Nees, 2016), can be confirmed, and the reason for their importance might be made more clear by giving underlying reasons as to why this factor plays a role, as the research that found this factor to be important did so using a survey.

4.1.1 Self-perceived Knowledge of the Technology

First of all, people were asked about what they knew about self-driving cars as a technology. This means that this 'factor' was not identified through open questions, but was instead specifically asked for. Nonetheless, it could play a significant role in people's user acceptance. 6 Candidates however did not clearly answer this question, which means that a total of 29 responses were recorded for this factor. Only 2 out of those 29 candidates claimed to already know much about the technology, as they had done studying projects about self-driving cars before. 13 candidates claimed to not know much about the technology at all. The following quotes represent some of the responses indicating this:

"I know some companies are already using some models in the market. I still don't know to what extent they are able to drive themselves or how they actually work." –IC8

"I'm not very familiar with the technology." – IC10

"I am not familiar with the term itself. Actually I don't know that much." – IC27

14 Candidates claimed to have heard some stories on the news. Most of the stories they heard involved relatively famous projects, such as the ones led by Google and Tesla. The following quotes show some of these responses:

“I know about Tesla, Uber, BMW. Saw some videos on YouTube on how it works.” – IC16

“Heard about it a year ago when Google tried this experiment. Apple also working towards introducing the self-driving car.” – IC30

Generally, these results show that although a large portion of the candidates are aware of the existence of the technology, many people know little or few about the technology.

4.1.2 General view of the Technology

As a second question, people were specifically asked about their view on the technology of self-driving cars is. This means that once again, candidates did not come up with this factor by themselves through open questioning. 35 Candidates clearly answered this question, and only 3 candidates had a negative view on the technology, as reflected in the following quote:

“I have negative attitude about it, because I really love driving, and I would never make it computerized, the process of driving, even if there is traffic.” – IC32

17 Candidates however looked neutrally towards the technology, mostly because they could see both the positive and the negative sides of it.

“I am both excited and skeptical about it.” – IC2

“I have heard that some company tested it on the road and it killed their driver. I think it’s an attractive technology for the coming years. For me it’s a bit mixed feeling.” – IC35

Finally, the other 15 candidates had quite a positive view of the technology, and thought the technology is cool and that it would be nice to see the technology introduced.

“I have a super positive view of it. You cannot do anything about it, these developments are coming and you cannot stop it.” – IC10

“Technologically it’s really cool, I saw a video in which is prevented an accident and I didn’t think it was that far already.” – IC14

Based on these results, it becomes clear that there is a generally positive sentiment towards the technology, and that only a relatively small amount of candidates seemed to oppose the technology. Some of the candidates who claimed to feel neutral about the technology also did so because they did not know enough about the technology, making it difficult for them to give a clear answer to this question.

4.1.3 Perceived Safety & Trust

Safety was one of the first factors brought up by many people during the open questioning. Not only was this factor brought up as one of the first, but it was also mentioned often. The 'perceived safety' might be more important than the actual safety, as people's acceptance is based on their own perception, rather than the actual facts regarding safety. Therefore, this factor is called 'perceived safety' and looks into how safe people think the technology is. One candidate reflected this in the following interesting quote:

"It's not about the actual safety but more about the perceived safety. When you go to the airport, the road to the airport is more risky than the actual flight on the plane." – IC2

26 Out of the 35 candidates mentioned this factor by themselves, and only 3 candidates considered self-driving cars to be dangerous. One of the quotes representing this belief is shown below:

"There are unexpected situations while driving, and I think the system cannot deal with this." – IC27

7 Candidates thought that safety would play a role in their acceptance, but did not clearly state whether they thought self-driving cars would be an improvement in safety or not.

"If it's safe I would like to use it" – IC9

"Safety does not depend just on you, but also on the car, so it would really need to be proven." – IC18

Interestingly enough, 16 candidates thought that self-driving cars would be an improvement in terms of safety, and that they could make roads safer.

"I believe that a self-driving car is safer than a human driver" – IC2

"Actually, I have a really positive view. I think they can do way better than us." – IC24

These results seem in line with people's general view on the technology, which showed a generally positive sentiment. This might indicate that perceived safety plays a big role in people's view and their acceptance as a whole.

Another factor that is closely linked to perceived safety, is the perceived trust of people in the technology. When people discuss their trust in self-driving cars, this often refers to trusting the car in avoiding accidents and driving safely. Nonetheless, these factors are not exactly the same. This shows in the fact that of the 15 responses recorded in this category, 6 candidates stated that trusting the car with your life might be an issue, and that it is easier to trust yourself or another person. This sentiment is reflected in the following quotes:

"Sometimes you don't know if the technology is as fast or as capable as a human being, making it difficult to trust." – IC14

"Uncertainty is actually when you talk about self-driving cars, this is what I would say, you can lose your life by driving, why to trust the computer to do the job for you." – IC32

8 Of the candidates who mentioned trust stated that they would be willing to trust self-driving cars, but that they would need to see empirical data, test results or other people using the technology first before fully trusting it.

“I might trust it when there's enough empirical research results.” – IC1

“First I would like to see some numbers” – IC2

“I would see how many people have this car, if it is already working and has been tested.” – IC20

Finally, one of the candidates stated that trust would also depend on the infrastructure and location where the technology is being used.

“I think in The Netherlands I would trust it more than in [my home country].” – IC24

Altogether, these results show that although people are willing to believe that self-driving cars are safer than regular cars, trust is still an issue that needs to be addressed. A majority of the people thinks that proof of the technology working can be enough to convince them, while a significant number of candidates did not mention this would be enough, or thinks it might be an issue for them altogether.

4.1.4 Comfort with the technology

Somewhat similar, but not the same as perceived trust, is comfort with the technology. 11 Candidates mentioned this factor, and 9 candidates said they would feel uncomfortable having no control of the car.

“Technology sounds cool, but I wouldn't feel 100% comfortable” – IC7

“I would be not so comfortable leaving everything to the car.” – IC30

“I would like to be able to have this sense of control of the car.” – IC31

One candidate however claimed that although this might be the case initially, it would quickly become normal.

“I don't know if I'll be comfortable. It will be strange, the first time will be uncomfortable, but you will get used to that, so it won't be an issue.” – IC16

One other candidate stated that instead of making people uncomfortable, autonomous vehicles could also make people feel more comfortable in their car instead.

“I've seen a video where the car already brakes before the driver sees it, so that's a good thing naturally. In principle, if you see that video, I think that would give you a calming feeling.” – IC22 (translated)

Again, these quotes and results show that despite the generally positive feelings, trust and comfort are still definitely issues that need to be addressed.

4.1.5 Pleasure of driving

Another important factor brought up by many different candidates by themselves was the pleasure of driving. 21 Candidates stated that this would be a factor for the acceptance in general, and 13 of those candidates stated to love driving, and would dislike it if this technology would take this away from them, as shown in the following quotes:

“People will never give up driving cars because it is so cool. What would stop me is the fun part of driving” – IC11

“For me personally driving is also fun. And also loss of driving pleasure would be a major factor for me.” –IC14

“It will also impact people who want to drive. Me I love driving.” – IC16

7 Candidates on the other hand claimed that driving pleasure was not that important for them, either because they didn't enjoy driving that much, or because they did not consider it to be very important for them.

“I enjoy the experience of driving, but it's not that important to me” – IC1

“I think some people enjoy driving cars, so they will not fully accept this. Actually I'm not one of these people.” – IC27

There was however a strong variance in the extent to which people valued driving pleasure. While some candidates claimed they would never give it up, others thought that although they do enjoy driving, they would still like a self-driving car instead, and another group claimed to not really enjoy driving much at all.

Some context can be given to this by looking at the traffic situation and the reason for travelling, which were mentioned respectively 11 and 4 times by interview candidates. Although one candidate did not clearly state their preference in terms of traffic situation, 7 candidates claimed to prefer self-driving functionality for long trips. 4 Candidates also claimed they would prefer the car to drive itself in traffic jams. Below are some quotes reflecting these beliefs:

“For a big trip it might be a bigger advantage than for a short trip. Would prefer to drive self on short trip, but self-driving on long trip” – IC7

“If I have to drive for half an hour to an hour, I definitely prefer to do it myself, but if I drive for longer I probably prefer something automatic so I can rest for a while, so there's not the risk of tired driving.” – IC29

“If you live in Istanbul and you spent three hours in traffic. Then you want to spend this time differently. But from Delft to Den Haag in 20 minutes I don't think I would use it differently.” – IC3

“If I had to stand in traffic every day I would definitely consider it, but otherwise I wouldn't” – IC13 (translated)

Similar arguments can be found when it comes to the reason for travelling. 3 Of the candidates mentioned that they would enjoy driving on vacation, and 3 candidates also stated that they would like it to drive autonomously to work.

“Maybe if you don't drive every day the same road, maybe on holiday it's enjoyable. But every day from point A to point B people would choose the car to drive itself.” – IC2

“I think it depends a lot on the type of driving. If I go through traffic in the work all the time I might consider it more than when I'm going on a vacation trip.” – IC8

“According to my lifestyle, if I use it for work or pleasure, I would buy if it adds something” – IC9

“When I drive to my work daily I would not mind not having to do that, but if I want to drive a trip or go on vacation then I would like to drive myself.” – IC21

These findings show that pleasure of driving is an important factor for many people that should not be overlooked, but that it depends on personality characteristics, and other contextual characteristics such as the traffic situation and the reasons for travelling.

4.1.6 Social influences

Another, slightly less often mentioned factor, are the social influences. 16 candidates that social influences in general could affect the acceptance of self-driving vehicles. Basically all candidates who mentioned social influences stated to follow the trend, and argued that they would be more likely to trust and accept the technology if they saw more people using it.

“I would like to see everybody using it, but it's difficult because now not everybody wants it and people only want it if everyone has it. Also how popular it is, because every innovation at the beginning there are a few people.” – IC18

“That completely depends on what the standard is at that moment. If it's the standard, then yes, if it isn't, then no. I'm like a herd animal in that regard basically.” – IC22

One candidate even argued that this is something that car manufacturers could use to their advantage.

“The point is to get the people who are more connected to the population to get started with this technology. If car manufacturers aim at well-known people or people who have certain position in society.” – IC24

Not only seeing other people using it, but also hearing from others about autonomous vehicles through word of mouth could affect their acceptance, according to 8 candidates.

“Yes I think the opinions from other people are the biggest part. If you hear it's good” – IC2

“Sure I know what I see on social pages and from word of mouth of my friends” – IC10

“Because of network externalities and others telling me how cool it is.” – IC14

Finally, another social influence that plays a role according to the candidates is the media. 3 Candidates mentioned the role of the media, and while two considered the media to be an important social influence, one candidate said to have a different view than the media, suggesting that the media is trying to influence the public opinion.

“And also media could stop me from buying it” – IC1

“I think the media do a lot in terms of expectation.” – IC16

“Ik sta er positiever tegenover dan de media het schetst.” – IC34

4.1.7 Gender

Another personal factor that could affect user acceptance is the gender of the candidates. As mentioned, 18 of the 35 candidates were male, and 17 candidates were female. No significant differences in the user acceptance were distinguished between both genders, although male candidates did seem to pleasure of driving more than female candidates. 12 of the 21 responses in this category were by men, and 8 of those 12 men claimed to value driving pleasure as important, while 2 did not consider it important and 2 responded neutrally. Of the 9 responses by women however, only 3 candidates claimed to value driving pleasure, while 5 candidates claimed it to not be important, and 1 candidate responded neutrally. One candidate also mentioned that men like driving more in general.

“If you want to drive, cause I think the experience of driving is also fun. This is also why you would want a steering wheel, because of the driving experience. Especially for men you maybe also see it as toys and if you cannot drive it yourself anymore, then you cannot have your toy anymore.” – IC31

4.1.8 Age

Similar to the gender of the candidates, age was controlled in this research by only selecting candidates between the ages of 18 and 40. As mentioned at the beginning of Section 4, the oldest candidate was 34 years old (2 occurrences), while the youngest candidate was 18 years old. The average age of the interviewees was 25,29 years old, with a median of 25 years old. No concrete evidence was found that suggested a correlation between age and acceptance level in the results of this research, although one candidate did suggest there may be a difference between young and old people.

“The old generation might think it's too complex.” – IC7

4.2 Technological factors

In this section, a look will be taken into the technological factors that influence the acceptance of self-driving cars. These are factors that, unlike the factors in the previous section, result from the characteristics of self-driving cars themselves, rather than personality characteristics.

An addition made to the literature by looking into this is that a factor previously identified in literature (see Table 2-2), perceived usefulness (Bjørner, 2015; Choi & Ji, 2015; Nees, 2016), is looked into in further detail by looking at the many benefits of autonomous vehicles. The same can be said for vehicle characteristics, mentioned by Nordhoff et al. (2016). On top of that, the existence of factors previously identified such as cost (Nees, 2016) can be confirmed, and the reason for its importance might become more clear by showing underlying reasons that might explain the importance of this factor. Since the work done by Nees (2016) consisted of a survey, this has not been done yet.

The technological factors were split up into three categories; benefits, drawbacks, and general factors, which cannot clearly be seen as either a benefit or a drawback. First, the benefits will be discussed.

Benefits

4.2.1 Ability to spend time on other activities

One of the most often mentioned benefits of self-driving cars, is the ability to spend time on other activities while traveling. Not only is this quite a big benefit, but it is also one that seems quite obvious to many people, as it was mentioned 21 times explicitly. All those 21 responses considered this to be a big advantage, and various activities that could be done instead of driving were already suggested. Some people went even further and suggested that the car could even look completely different, to better suit other activities. Out of the 14 respondents who did not mention this benefit during the open questioning, a portion might have considered this benefit too obvious to be worth mentioning, as it seems unlikely that 14 candidates did not think of this benefit at all. This is just speculation however, and cannot be retrieved from the results. Below follow some quotes by candidates on being able to do something else.

“If I don't consider safety and things, I would prefer the self-driving car, because I could spend my time differently” – IC1

“The main advantage is that you should see driving a car no longer as a waste of time.” – IC10

“If in my drive to work I can save some time by already working. Would prefer a car that doesn't even have shape or structure of regular car, so that it can be optimized for the people who are inside, like a small living room or working space or something.” – IC11.

“But then of course if you can just enjoy more your family trip then this becomes valid for everyone, so yes I think it's the future.” – IC24

“I would also like it if you would have a self-driving car driving you 100%, so you can just look outside in nice areas” – IC33 (translated)

4.2.2 Decreased traffic congestion

A much less frequently mentioned benefit of autonomous vehicles was the ability of the technology to reduce traffic congestion. This is likely because this benefit is more of a consequence of improved driving characteristics of self-driving vehicles, rather than a direct influence of giving away control. Therefore this benefit might seem less obvious to many people than the ability to spend time differently for example. As a result, this factor was mentioned a mere 6 times. A number of quotes follow to reflect the responses given:

“Yeah traffic will be optimized because you don’t have those human factors that you have to react, traffic lights, hitting something.” – IC17

“On the one hand I think it is a solution for specific problems in crowdedness in traffic, where if everything communicates it can also really work” – IC21

“Most of the traffic jams are caused by humans” – IC25

4.2.3 Enhanced mobility for elderly/young/impaired

Also rarely mentioned was the enhanced mobility for elderly, young, or impaired people. Again, this is likely to be the case since this factor might be less obvious to many people, especially since all interview candidates questioned were in possession of a drivers’ license, and would therefore not directly encounter this benefit themselves. 4 Candidates did mention this factor however, as shown below:

“Nearsightedness, mental stress, fatigue due to inability to stretch legs not an issue with a self-driving cars.” – IC7

“Or if for any reason I have some type of disability that won’t allow me to drive for 100%.” – IC8

“I think that it’s good for old people too, because they can drive the car at an older age.” – IC25

“In extreme issues, for disabled people or colorblind people who are not allowed to drive, this gives them a chance.” – IC29

4.2.4 Ability to share car & Autonomous parking

An interesting factor that was mentioned 9 in total, was car sharing in some form or another. 6 Of those candidates even mentioned that self-driving cars could mean that privately owning a car becomes a thing of the past. While some candidates thought that self-driving cars could replace trains or function as big buses, many people referred to the ability to rent a car or to call a self-driving taxi. It is interesting to see

that although these are quite radical predictions which would involve a lot of changes, this benefit received more mentions than a much 'simpler' benefit such as reduced traffic congestion. Below follow a few quotes with people's beliefs on car sharing in the future:

"People for us will buy cars in the future. Also the way in which cars are sold and the mentality behind purchasing cars. Companies will buy cars and we will rent them" – IC10

"I think other trends will also appear. Like carpooling where people will just step in a car when they come by." – IC17

"But not exactly on the roads that we now have 1-4 person cars. I think that it's more likely to be 30 bigger cars per village" – IC12 (translated)

"I think it's going to be more like that, like for example a taxi with no more driver that you call and it picks you up." – IC28

"Then you do not need private cars, you could have I don't know self-driving buses, then it becomes public transportation actually. If I have a self-driving car I don't know why I would use it instead of the bus for example." – IC32

It is interesting to note that many people do not see a reason to differentiate cars from taxi's or public transport anymore when they become self-driving, as this suggests that driving the car yourself is such a big reason for owning a car. It could on the other hand also suggest that people expect self-driving cars to significantly improve taxi and public transport services, meaning that the benefit of owning a car is made smaller.

Another thing that could be accompanied by the ability to share cars is the fact that one would no longer have to park the car, and that the car could do this autonomously instead. One candidate mentioned this factor, as seen in the quote below:

"That for example it also parks itself if you're not in it. That you can always have your car with you" – IC33 (translated)

Drawbacks

4.2.5 Ethical issues

Besides the benefits, drawbacks of the technology were also mentioned. The ethical issues that come along with accidents involving self-driving cars were mentioned by 11 different candidates. Many candidates claim this is a difficult question, to which they do not know a clear answer themselves either. One candidate claimed this would not be a big issue, as the technology can be trusted more than people. Another candidate claimed to be more willing to accept a self-driving car if it chose to accept the driver inside the car, rather than the people around it. A third candidate suggested that not only the issue of who to save in an accident should be looked into, but also who is responsible in a crash between a self-driving and a regular car.

“If in a mixed situation the self-driving cars chooses to protect me better, I would choose it” – IC1

“Who is responsible? If I get the bill do I send the bill to Tesla?” – IC5

“Acceptance derives from an ethical perspective. Personally I don't feel this is an issue, because I rely way more on software than on people on the street, such as my grandpa.” – IC11

“And what if some kind of accident happens, whose fault is that, is that a fault of the person or the system itself.” – IC27

“Yeah that's a very important issue I think, that needs to be regulated very well, legally, who is responsible when something happens, self-driving vs non-self-driving for example” – IC33 (translated)

This shows that people do not only consider the fact that the car might have to make choices between life or death, but also that many people are uncomfortable with the idea of a company or algorithm being pointed to as responsible for an accident, rather than a person.

4.2.6 Cost

The most often mentioned potential drawback was one that does not even directly involve the technology itself, namely the price of a self-driving car. As many as 32 out of the 35 candidates mentioned that the price of a self-driving car could play a role in their purchasing decision of a self-driving car. Despite the fact that price could be an issue for many, 23 people stated that they would be willing to pay a small premium compared to a regular car after asking about this. Most candidates mentioned this premium to be around 10 to 20 percent. 6 Candidates stated to not be willing to pay more for a self-driving car, while 3 candidates did not explicitly state their willingness to pay more or not.

“Price would be a reason not to buy if it is too high. Wouldn't pay extra for it” – IC7

“Yeah of course you pay a premium for that” – IC16

“It will of course for a large part depend on price. First I think it might not even be available to available to everyone, but in the end it will be normal. When I'm on the road often I would definitely pay extra, because you would also have extra free time left.” – IC21 (translated)

“Would not directly be willing to pay more for a self-driving car, because then you would really need to have too much money” – IC22 (translated)

It has to be noted here however that price seemingly only plays a role for the consumer's acceptance, as mentioned in section 2.3.1.

4.2.7 Loss of jobs

Loss of jobs was only mentioned by 2 candidates. One candidate mentioned that driving schools might disappear and that this would result in a loss of jobs, while another candidate mentioned taxi drivers

becoming obsolete. The fact that this factor was only mentioned twice however shows that many people are not aware of it, or do not consider it an important factor worth mentioning.

“Driving schools will close if technology is fully accepted, because you don't need a license anymore.” – IC4

“Positive step forward. Speeding tickets would be reduced, turnover public transport. Less jobs because taxi drivers are becoming obsolete. Traffics will be solved, less chance for accidents” – IC35

It is interesting to note that the second candidate mentioned this factor among a number of benefits of the technology, indicating that this candidate likely does not see the loss of jobs for taxi drivers as a drawback at all.

4.2.8 Security Issues

More frequently mentioned than the loss of jobs were security issues. 5 People mentioned this factor and showed to be aware of this as a serious concern, although it was not repeated by many.

“I would have to know it's already well developed in a responsible way, and that there are no security issues like someone can hack into the car and make it go crazy.” – IC17

“I also don't believe in humans that much because they make mistakes, but also the machine is not perfect, also it can be easily hacked, and then it might cause even bigger accidents.” – IC28

“But also in terms of security, if you can hack one can you then hack them all and hit the brakes. There need to be clear standards for that, that already exist on small scale, but that needs to be shielded very well” – IC33 (translated)

General

4.2.9 Ability to drive manually

Despite the fact that this research only considers self-driving cars with autonomy level 4 or higher, 16 candidates mentioned that the presence of a steering wheel would be a factor in the acceptance of self-driving cars. Of those 16 candidates, 15 candidates thought that the ability to drive the car in ‘manual mode’ would make them more likely to accept the technology. This is likely because it would still allow people who enjoy driving to drive themselves. Some mentioned that this would especially be important in the early phase of the introduction, and that this might become less important at a later stage. 1 Candidate however preferred the cars to not have this option at all, as it would result in a mix of human driven and self-driving cars on the road, which as mentioned under the next factor ‘transition period’, might make traffic less safe.

“I think having a steering wheel would make it worse, because if the others are autonomously driven and I'm the only one driving myself who's not, then I cannot predict what the others are doing” – IC1

“I don’t think I would like to intervene, but I consider driving as a pleasure sometimes. So I would like the chance of driving as a pleasure.” – IC9

“It would be nice if both are possible. In The Netherlands I wouldn’t care, everything is busy anyway. But it would be nice to for example in Sweden on vacation to be able to tour around yourself, that you have the feeling of driving yourself” – IC33 (translated)

4.2.10 Transition period

Interestingly enough, many people stated to be uncomfortable with a so called ‘transition period’, in which a mix of self-driving cars and human driven cars would be on the road at the same time. Of the 16 responses on this factor, 11 candidates thought that a combination of both self-driving and human driven cars on the road could be more dangerous than when all cars would be either human driven or self-driving. Most candidates however mentioned that it was not necessary for all cars to be autonomous, but that at least a significant percentage of all cars should be to make them feel safer about the technology. The following quotes reflect these beliefs:

“I don’t want to in the minority on the road as a user of self-driving cars.” – IC1

“If all the cars are self-driving I think it would be safe, I would trust it, but if I am one of the few persons that my car is driving on its own I wouldn’t want it, because I might think I am able to see something faster.”- IC18

“The thing is that I wouldn’t trust it right now, because other cars are not using the same systems. So if the driving belongs to human actions and decisions anything can happen to my car that is self-driving. I would trust it completely if at least some percentage of cars is doing the same, but not if it’s just me.” - IC24

Interesting about the fact that 11 candidates share this concern, is the fact that there is no proof that a mix of self-driving cars and human driven cars is actually more dangerous. On the other hand, it has also not been proven yet that this would not be an issue.

4.2.11 Ease of using the technology

Only 2 candidates mentioned the ease of using of the technology as a factor. This is interesting, as perceived ease of use plays an important role in the Technology Acceptance Model (TAM) and is consequently considered to play a role in most of the literature, as shown in Table 2-2. The results here show that although it might indeed play a role, not many candidates considered it to do so. The two responses given were also short, and neither of the two candidates addressed ease of use in depth. One candidate said the technology should be user friendly, while another candidate stated it might be too complex for the older generation.

“It needs to be very user friendly” – IC5

“Old generation might think it’s too complex” – IC7

4.3 Table with factors

At the end of the interview, each candidate was given a table consisting of 18 previously identified factors. This table was constructed by taking both factors mentioned in previous research, as well as personally thought of factors. The aim of this table is to see whether candidates respond differently when all the factors were given to them upfront. By doing this, the reasons why certain factors have not been mentioned frequently during the interviews can be distinguished. If the factors are also not valued in this table, it might indicate a lack of importance, while if they are ranked highly in the table, it might indicate a lack of awareness of this factor. Candidates were asked to rank the 5 most important factors, which led to the results in Table 4-2.

As can be seen, the most important factor according to the responses given in this factor is ‘Safety’, which is unsurprising. More surprising however is that ‘Decreased traffic congestion’ received the second most amount of points, despite being mentioned only six time in the interviews. The same can be said for ‘Enhanced mobility for elderly, young, or impaired’, which only received 4 mentions in the interviews. ‘Higher speed limits’ also receives 7 mentions, while receiving 0 in the interviews. On the other hand, ‘Pleasure of driving’ is only mentioned 6 times, while being mentioned 21 times in the interview rounds. These results show that there is a significant difference in results between the open questions, and the table given to the candidates at the end.

It is also interesting to note that two of the factors from the table, namely ‘loss of privacy’ and ‘higher speed limits’, did not receive any mention during the interviews at all, yet still managed to receive respectively 2 and 7 mentions in the table. Social influence by media on the other hand received no mentions in the table, while it was mentioned 3 times during the interviews.

When the order of importance given by the candidates is weighted, with the number 1 factor being weighted 5 times as heavy as the number 5, the number 2 factor 4 times, etc., it becomes even more apparent how important the factor safety is in the user acceptance of the technology. It also becomes clear that the order of some factors is switched. ‘Decreased traffic congestion’ for example is mentioned as fourth most important factor 5 times, causing both ‘Ability to spend time on other activities’ and ‘Comfort with the technology’ to overtake it. The same can be said for the ‘type of travelling’, which ranks lower than ‘Economic costs’, ‘Amount of self-driving cars already on the road’ and ‘Ethical issues’, despite receiving more mentions in total. Since the weight given to the factors here is somewhat arbitrary however, it is difficult to objectively rank these factors in terms of importance. It can be observed however that, with the exception of ‘Safety’ and ‘Ethical issues’, the weighted positions and relative amount of points scored do not vary from the non-weighted ranking very strongly.

The conclusions and discussion that can be derived from the discrepancy in results follow in Section 5.

Table 4-2 Table with factors provided to interview candidates

| Factors playing a role in acceptance | #1 | #2 | #3 | #4 | #5 | # Of times mentioned | Weighted # of times mentioned |
|--|----|----|----|----|----|----------------------|-------------------------------|
| Safety | 18 | 4 | 3 | 3 | 2 | 30 | 123 |
| Decreased traffic congestion | 2 | 2 | 3 | 5 | 3 | 15 | 40 |
| Ability to spend time on other activities | 2 | 4 | 5 | 2 | 1 | 14 | 46 |
| Comfort with the technology | 2 | 5 | 2 | 4 | 1 | 14 | 45 |
| Enhanced mobility for elderly, young, or impaired (drunk people, etc.) | 0 | 4 | 4 | 1 | 4 | 13 | 34 |
| Type of traveling (roadtripping or commuting to work) | 1 | 1 | 2 | 3 | 4 | 11 | 25 |
| Economic costs | 1 | 2 | 4 | 3 | 1 | 11 | 32 |
| Amount of self-driving cars already on the road (transition period) | 2 | 3 | 1 | 2 | 3 | 11 | 32 |
| Ease of using the technology (navigating, configuration, etc.) | 1 | 0 | 2 | 5 | 2 | 10 | 23 |
| Ethical issues | 3 | 2 | 1 | 1 | 1 | 8 | 29 |
| Ability for car sharing | 1 | 2 | 1 | 2 | 1 | 7 | 21 |
| Higher speed limits | 0 | 1 | 2 | 1 | 3 | 7 | 15 |
| Pleasure of driving | 0 | 2 | 1 | 1 | 2 | 6 | 15 |
| Loss of jobs (taxi/truck drivers) | 0 | 0 | 1 | 0 | 2 | 3 | 5 |
| Social influence through word of mouth | 0 | 1 | 0 | 0 | 1 | 2 | 5 |
| Loss of privacy | 0 | 0 | 1 | 0 | 1 | 2 | 4 |
| Hunting for parking eliminated | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| Social influence by media | 0 | 0 | 0 | 0 | 0 | 0 | 0 |

4.4 Role of National Government & Automotive Industry

4.4.1 Role of National Government

All candidates were asked about what they think of the national government's role in the introduction of the technology, meaning that all 35 candidates responded to this question. 11 Of the respondents state to be in favor of subsidies in order to promote self-driving cars, as can be seen in the quotes below:

"I can imagine new systems being built around it, new highways, roads, laws, etc. If it is really more safe I can imagine they will subsidize etc." – IC2

"Technology change in this field is too powerful to be regulated. Government should use for sure an active position. Not only in regulation but also incentivization." – IC10

"Yes that is important naturally. There have to come subsidies before people will start doing it. In the beginning there must be regulations so that it can be tested. The earlier they do this, the earlier the

technology can be there. Subsidizing this is like investing in transportation, so I think they will play a big role” – IC34 (translated)

4 Candidates however state that the government should not do this.

“Government could enforce that all cars have self-driving functionality. When they sponsor it people will become suspicious.” – IC6 (translated)

“I think they have to cooperate with companies, because also the infrastructure has to be there, so they should work on that. Actively pushing is not what the government should do.” – IC27

Almost every candidate (naturally) states that regulations and legislation should be updated, as well as that infrastructure should be changed to suit self-driving cars. 4 Candidates state that the national government should develop a framework, stating a number requirements that have to be fulfilled by every autonomous car. One candidate also mentioned that EU countries should work together on this.

“The government has to provide policies to stimulate and also policies to regulate. You need to have kind of a framework behind it.” – IC3

“Regulation follows innovation. National level first, then communitarian. EU should work together so it’s the same in every country. Since innovation is there, since it’s already happening, government should regulate. government should give the regulation framework let’s say. No I don’t think the government should insist on adapting that, though it can be safer. It all depends on how this technology is managed.” – IC16

5 Respondents also state that the government should help in increasing the acceptance of the technology by promoting it, while 6 candidates state that they should work together with manufacturers in order to smoothen the introduction.

“Yeah I think it is in the interest of the government to encourage this technology because it means that many of the functions that they do could be fulfilled by the market. For example you don’t need signs with speed recommendations. So I think it’s in their interest for them because it could save them money.” – IC17

“I think it should be a teamwork. (between government and manufacturers)” – IC18

“Yeah I definitely think they should be involved, mainly in increasing awareness of people, because yeah it’s kind of easy to describe how a self-driving car works, but then the acceptance of people is really hard to overcome or to get. When the interest for the government is really high, they should propose giving incentives. They really have to recognize these cars, and all the dangers and the benefits they bring, and the government should do this (promote it).” – IC24

“I think they have to cooperate with companies, because also the infrastructure has to be there, so they should work on that. Actively pushing is not what the government should do.” – IC27

“Yeah that’s a very important issue I think, that needs to be regulated very well, legally, who is responsible when something happens, self-driving vs non-self-driving for example” – IC33 (translated)

The following interesting quote was also given by an interview candidate:

“If the government keeps defensive position, it’s way more difficult to trust automakers.” – IC11

This quote shows that the stance taken by the government plays an important role in people’s acceptance, and that the interaction between the government and manufacturers is important. Another interesting quote is the following:

“It has to be tested well by something similar to crash tests now for example. Or for example introducing some sort of carpool lanes for self-driving cars” – IC5 (translated)

This candidate proposes that testing of self-driving cars is standardized in a similar way to current crash tests, which is an interesting suggestion. At the same time, a solution for the so called ‘transition period’ is also offered in this quote, by providing separate lanes for self-driving cars.

4.4.2 Role of Manufacturers

28 Candidates responded on what the role of the manufacturers is in the introduction of the technology. 6 Candidates states that the manufacturers should introduce the technology step by step, and not to rush it. An example of this is one of the candidates who mentioned that car manufacturers could focus on a niche market, or smaller target audience initially.

“I guess it could be like a niche first, before reaching the mass market” – IC3

“Just bring it slowly, not rushed, just step by step increasing acceptance” – IC5 (translated)

“If you don’t let control go a 100% at the beginning, it would increase acceptance because at the beginning you don’t know what to expect. So introduce it in steps” – IC25

Another 6 candidates think that acceptance can be improved by demonstrations. One candidate suggests that the technology can also be ‘demonstrated’ through well-known people.

“Organize some demonstrations, organize some events. Also involve universities, since they provide knowledge.” – IC4

“Also like really use these cars in famous demonstrations. Demonstrations are really nice because you really let people feel what it’s like. They have to convince people about how the car behaves in traffic.

Maybe make a movie about it, that would be nice. The point is to get the people who are more connected to the population to get started with this technology. If car manufacturers aim at well-known people or people who have certain position in society.” – IC24

One candidate also stated that it would help if manufacturers focused on making it possible for autonomous features to be added to existing cars as a plug-in or add-on, so that the barrier to adopting the technology becomes smaller.

“Manufacturers should push it as a plugin rather than a real car. Maybe they’re only aiming at top of the pyramid. If you only focus top of pyramid as premium product you won’t replace regular cars. You have to bring down prices or use add-ons or features.” – IC30

The best approach to take according to 10 respondents is to emphasize the safety of the technology in the marketing efforts, while only 2 respondents think that the technology should be assumed safe, and that this focus on safety is therefore unnecessary.

“Car manufacturers have to come with a good safe model to convince the government it would fit” – IC12 (translated)

“The more the car manufacturers show how safe and useful it is, the better it will be for the acceptance.” – IC14

“Car companies first have to show it’s safe. Show that technology can make better decisions than humans. Show it to the customers well. Show the appeal of the novelty, wanting to be part of the future.” – IC20

One candidate interestingly enough suggests the car companies to specifically make use of social media in increasing awareness of the technology.

“Car manufacturers would play an important role, mostly in the marketing department. Now everything is in internet and social media and everything. They should use this to show the technology working.” – IC8

Another suggestion made by a candidate is that manufacturers should work together with the government.

“Companies could also propose a solution to the government and they could use it, because the manufacturers know this needs to happen for it to become a success. Sell it as a high-tech product, something that saves you time. And that usually when you take the train for example you’re not driving it but it doesn’t take you to far places. Yes high mobility and with comfort.” – IC31

Interestingly enough, there is also disagreement on whether to listen to the consumers or not. While many candidates argue to take the concerns and opinions of the consumer into account, one candidate argues that manufacturers should not take potential buyers too seriously.

“Don’t listen to consumers, they don’t know what they want anyway.” – IC26

“If there’s a lot of customers like me, they should keep the steering wheel, and just listen to the customers.” – IC28

4.5 Reflection on results

Based on the factors found during the interviews, a figure has been constructed in which the found factors and their relations to user acceptance are visualized. This can be seen in Figure 1-1Fout!

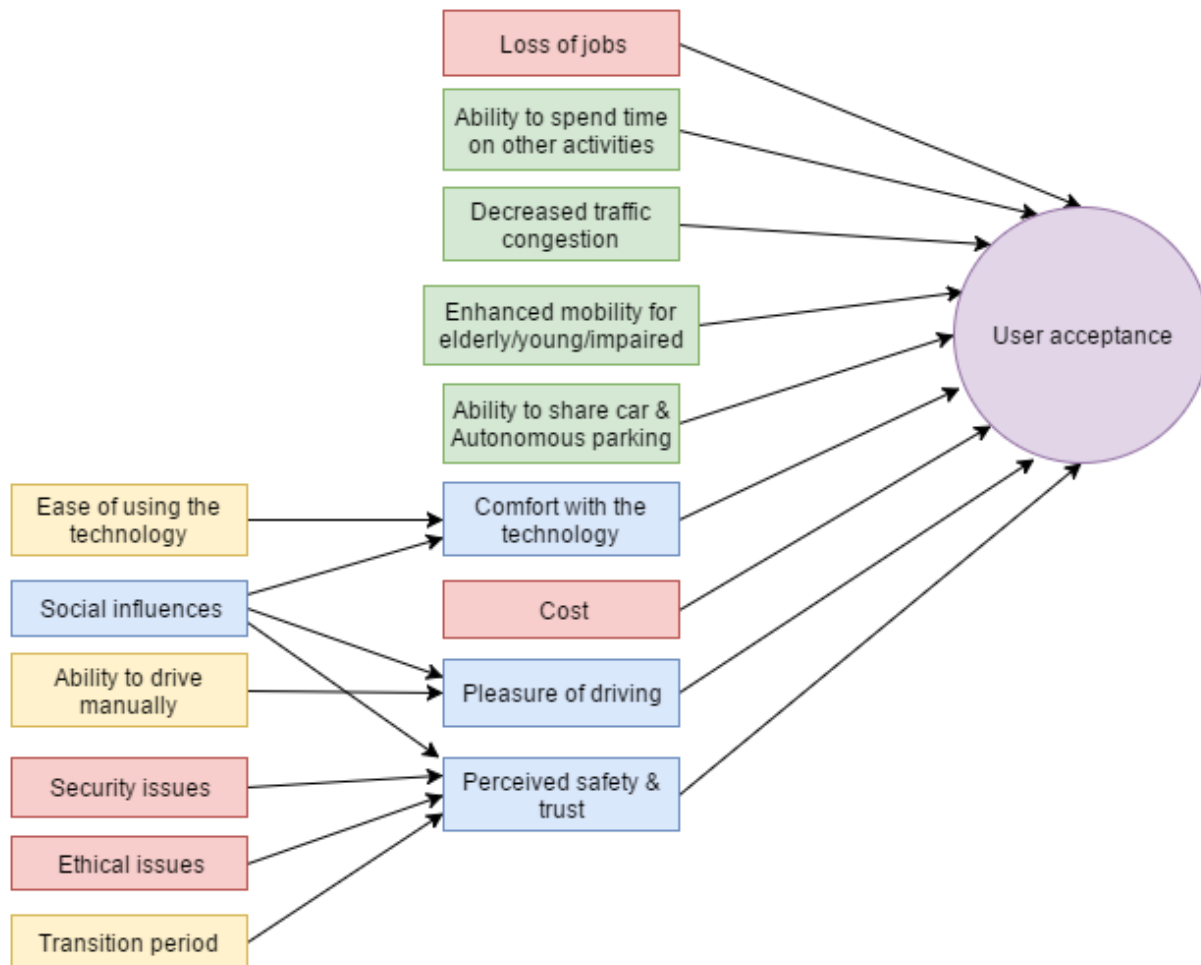


Figure 4-1 Visualization of the found factors and their relations

Verwijzingsbron niet gevonden..

The factors have been given different colors to show in which category they fall. Green factors represent advantages of the technology, while red boxes indicate negative aspects of self-driving cars. Blue factors are personal factors, which can have both a positive or a negative effect, and yellow boxes indicate technological factors that are not inherently positively or negatively related.

As can be seen, some of the factors, such as social influences, indirectly affect user acceptance, while others have a more direct relation. Some of the factors shown on the top half of the figure, such as 'Loss of jobs', do seem to have an effect, although the lack of mentions in the interviews makes it hard to

establish this relation. Some of the more complex relations in the bottom half of the figure have received far more mentions, allowing for a better understanding of how these factors influence the user acceptance of the technology. The figure should therefore be seen as somewhat of a draft, and not an indisputable framework.

When comparing the found factors to the ones found in the literature, there are no big disagreements on the factors that play a role of importance. A difference however is that while most of the literature uses more abstract or perhaps general terms, such as 'perceived usefulness' (Choi & Ji, 2015; Davis, 1985) or 'technical competence' (Choi & Ji, 2015), this work aims to find the more concrete factors that play a role for the acceptance of autonomous vehicles in particular. Factors such as 'Decreased traffic congestion' and 'Enhanced mobility for elderly/young/impaired' could be seen as part of the wider term 'perceived usefulness', but by keeping this distinction during the interviews a more in depth view of the issue at hand is created.

When looking at the differences in importance of the several factors, a few things can be noted. First of all, not all literature seems to make this distinction, but the relations between several factors do show which factors appear to be more important. An example of this is 'Trust' in the Technology Acceptance Framework (Huijts et al., 2012), which seems to affect many other factors, such as 'Perceived costs' and 'Perceived risks'. In this work however, factors have been found that in turn influence trust itself, as also the case in the work of (Choi & Ji, 2015). The interviews have also shown however that measuring trust itself is often very difficult, as many of the candidates barely make a distinction between trust and factors that influence it, such as 'Security issues' in this work or 'Technical competence' in the work of (Choi & Ji, 2015). The lack of direct influences on costs does appear to show that this factor is seen as less important than for example trust, which is something that does not become very clear from existing literature.

The interviews also indicate that many people do not have a very clear image of the technology in general, making it difficult for them to form a well-informed opinion on the topic. In existing literature that made use of surveys, this lack of a clear mental model often does not show very clearly, making it difficult to assess how much thought has been put into the answers given by the respondents. As a result, it becomes difficult to create a conclusive model on the user acceptance in general, showing that extensive research in this area may be a bit premature.

5 Discussion of results

5.1 Factors found & Underlying reasons

After all the results have been extensively elaborated on, a number of findings can be made based on these results. The conclusions that are drawn here are often not solely based on the codified results provided in the previous sections, but also on impressions and tacit signals that were observed during the interviews. This is an important distinction compared to previous survey research done, where these tacit signals and the underlying reasons for factors mentioned were not taken into account.

It is found that people have a generally positive to neutral view of the technology, and that only a few candidates look negatively towards the introduction of self-driving cars. A potential reason for the fact that many people had a neutral view of the technology is that many people argued to not know much about the technology, making it difficult for them to create a clear opinion on it. When considering the fact that most of the interview candidates claimed to have heard of the technology mostly through projects such as the ones from Google, Tesla, Uber and Apple, it becomes clear that there might be opportunities for these companies to shape the opinions of many people by focusing on creating awareness of the advantages of self-driving cars, such as car sharing and or the ability of the car to find a parking spot for you. If these companies would manage to do so successfully, doing this research again at a later date would lead to more mentions in these categories during the interviews, which might result in an overall even brighter view of the technology.

Despite the fact that many candidates mostly knew about the popular self-driving car projects reported in the media, very few candidates mentioned the social influence of the media to play an important role. This could suggest that people are not aware of the extent to which their opinion is shaped by the media. On the other hand, since this factor likely does not directly influence acceptance, the low amount of mentions could also be the result of the methodology used.

One important observation when looking at the results of the first interview round, is that many categories have received far fewer mentions than the maximum of 35, if all candidates were to mention the importance of a factor. Examples of this are the small amount of mentions for the benefits 'Enhanced mobility for elderly, young, or impaired' (4 times) and 'Decreased traffic congestion' (6 times), but also 'loss of jobs' (2 times) and 'security issues' (5 times). A likely explanation for this is the fact that most people are unaware of many of the advantages and disadvantages, and will therefore not consider them when discussing their acceptance of self-driving cars. This indicates that people might not have a clear view of the capabilities of self-driving, and that they might therefore be unable to form a well-considered

opinion on the technology. Although there are both benefits and drawbacks that are mentioned infrequently, other factors such as the loss of driving pleasure and the 'transition period', which are mostly seen as negative aspects of the technology, are mentioned more frequently than many of the benefits of the technology, which indicates that people are more aware of many of the negative sides of the technology than the positive ones.

The table given to candidates at the end of the interviews and the discrepancy between its results and the results in the interviews shows that merely mentioning some factors might be enough to make people aware of these factors. A clear example is the factor 'Decreased traffic congestion', which was only mentioned 6 times by candidates in the interviews, but was considered to be the second most important factor in the table. When just mentioning this benefit, this might be enough to trigger a thinking process in which people start thinking about how the technology could lead to such a benefit. It shows that for such factors, candidates might not necessarily need to be swayed by evidence proving the improvement in traffic flow in order for their acceptance to be positively impacted by this factor. Perhaps even more striking examples of this are 'loss of privacy' and 'higher speed limits', which both received 0 mentions during the interviews. Nevertheless, these two factors received respectively 2 and 7 mentions in the table, suggesting that some people instantly consider these to be within their top 5 most important when confronted with them. Despite the fact that only a handful of people mentioned these factors in the table, it is another indication to believe that awareness of all of the factors is lacking.

Another interesting observation is the fact that while only three candidates had a negative view on the technology as a whole, a large number expressed concerns regarding the transition period from human driven vehicles to autonomous vehicles. Despite most candidates admitting to know little of the technical capabilities of self-driving cars, many people perceived a mix of human driven and autonomously driven cars on the road to be problematic, and some even argued it might be more dangerous. Indeed, there is research to suggest that this mix might introduce new risks and therefore diminish safety improvements (Litman, 2016, p. 4), but it is unlikely that safety will actually decrease as a result of this. Nonetheless, this factor might hamper the technology in gaining an initial user base. This is emphasized by the fact that most candidates reported to not want to be one of the first users of the technology.

A similar thing can be said about the ethical issues, which many candidates deemed to be a problem. The fact that many people have a relatively positive view of the technology, despite having such serious concerns is interesting to note. A possible explanation for this could be the fact that most people are confident in the ability of the government and the manufacturers to solve these problems, before introducing these vehicles to the market. In the eyes of the interview candidates therefore, these concerns would no longer be an issue when deciding to adopt this technology. This is backed up by the fact that even interview candidates who are currently skeptical of the technology still think that self-driving cars will become a commonality in the future.

Conversely to the fact that many factors were more often listed as important in the table than in the interviews, the 'pleasure of driving' was deemed to be important by only 6 different candidates in the table, while as many as 21 candidates mentioned this factor during the interviews. This could once again

be explained by the fact that people are not aware enough of many of the other factors, while driving pleasure is something that comes to their minds more quickly. When confronted with these factors in the table however, driving pleasure is quickly transcended by these other, more important factors. Another explanation as to why many people do not rate pleasure of driving as highly, is the fact that many people expect self-driving cars to come with an option to drive manually anyway. This technological feature would alleviate the concerns of driving enthusiasts, and therefore improve acceptance. On the other hand however, this option to drive manually might make people who dislike the mix of self-driving and non-self-driving cars uncomfortable. Essentially, this would cause the problems many people anticipate during the 'transition period', to perhaps become permanent in nature.

Unsurprisingly, price turned out to be one of the most important factors in buying an autonomous vehicle as well, and was mentioned 32 times in the interviews, as well as receiving 11 mentions in the table. This shows that despite the fact that as many as 23 candidates claimed to be willing to pay more for a self-driving car, the price of the technology compared to regular cars will still be one of the most important factors.

Furthermore it is interesting to note that eight different candidates mentioned that the price of purchasing a car might become irrelevant, as they suspect that self-driving cars will completely change the way in which cars are privately owned and shared, and that public transport might be receive a major overhaul as a result. This is something that is very interesting for the national governments to keep an eye on as well, as it could mean that many more regulations would be impacted than perhaps expected if self-driving cars would be used in the same way as current cars.

It is also interesting to note that some candidates seemed to automatically assume self-driving cars would be electrical vehicles, and that they would have a positive contribution to the environment. Despite the fact that self-driving cars do not necessarily have to be electric, it is likely that they will have a positive impact on the environment (Urmson & Whittaker, 2008, p. 66), meaning that this is an important factor for many people. This factor was not included in the coding of the interviews however, as most of the mentions it received referred to electrical vehicles mostly, rather than the ecological benefits of self-driving cars themselves.

After discussing the findings with experts, it becomes clear that the findings are mostly found interesting, and seen as comparable to previous research and ideas people had. None of the experts stated to disagree with the findings presented here, but also did not add much to them. It does show however that most experts agree that the concerns of many candidates are justified, and that the technology first has to prove itself.

The most important tacit insight that the interviews have given compared to survey research is the fact that many people do not have a clear image of the technology as a whole. This is not only reflected by the candidates saying this themselves, but also by the general impression that people give off when discussing the topic. This shows that for many people, the concept of self-driving vehicles is still somewhat vague and futuristic and that they therefore have not put much thought into it. This shows

that it is perhaps too early to be able to accurately investigate which factors will truly turn out to be the most important when it comes to the user acceptance of these cars.

5.2 Implications government & automotive industry

The results found in the previous section and the findings that follow from these results can also be used in order to discuss the potential implications for both the national government and the automotive industry. Suggestions made by candidates regarding the actions that can be taken by these parties will be considered, and the found factors are also used in order to create a number of implications. This is especially relevant since it fills an existing gap in the literature, as indicated by Nordhoff et al. (2016).

The results of this research show that many people appear to be unfamiliar with all the benefits and drawbacks of self-driving cars, and that they are unable to form a clear image of what the technology entails. Because of this, and the fact that there are currently no level 4 autonomous vehicles on the market yet, it seems premature for the national government to actively push for the introduction of the technology at present. What could already be done by the government however is trying to increase awareness of many of these benefits and drawbacks, although this seems to be a job mostly reserved for the car manufacturers. Both Experts 2 and 3, agreed with the notion that actively pushing the technology seems premature at this time. Expert 3 stated that since there are still many uncertainties, it is difficult to currently already undertake concrete actions. Expert 2 also said that although some steps are already taken, a wait-and-see approach is also taken in some regards. Expert 4 agreed with this notion, but mentioned that he could not imagine self-driving cars being introduced with some sort of directive being in place beforehand.

Since the technology is developing rapidly, and since many people have a generally positive view of the technology, it seems likely however that the introduction of level 4 self-driving cars is only a matter of time. This means that the government should focus on taking preparatory measures, to ensure that potential issues are solved in a timely manner, as also suggested by multiple interview candidates. Problems such as the ethical dilemmas and regulatory changes can already be addressed now, and potential infrastructural adjustments can already be implemented for the future. Expert 1 states that it is difficult to already address these issues, as he finds that many ethical dilemmas assume a level of understanding of self-driving cars that is currently not yet present. He does state however to have seen a consensus form among people that the person inside the vehicle should not be sacrificed in favor of others. In terms of accidents regarding self-driving and non-self-driving vehicles, he points to the solution proposed by Volvo (Gorzelany, 2015), who claim to accept 'full liability' whenever one of its cars is in autonomous mode. Expert 4 added that when looking at the ethical issues, historical cases can be looked at to make decisions as well, rather than just looking at the different philosophical schools. In terms of changes in regulations, Expert 2 stated that regulations, such as the declaration of Vienna, are already being adapted by experimental laws, so that self-driving cars are adequately taken into account.

An interesting suggestion made by one of the interview candidates was that the government could set up tests similar to current crash tests, which an autonomous car should successfully pass in order to be allowed on the road. By doing so, cars can also be given a clear 'level' of autonomy, similar to safety ratings that are currently already in use. On top of that, by developing such a framework, more demands can be made by the government about the requirements a self-driving car should fulfill. This could ensure the fact that cars made by different manufacturers still function in a similar way. One of the experts interviewed, Expert 1, stated that plans are indeed already there to standardize testing procedures, but that testing currently still occurs in a free form. Expert 2 also added that international coordination is also already occurring to make sure that these vehicles indeed function similarly and are able to communicate with one another. Expert 4 stated that it could be interesting to set up special zones in which the vehicles can be tested, so that a sort of midway between the lab and the real world is created. Such zones have been set up before in Japan to test robotics projects, with good results.

The results from this research also show that if the government wants to stimulate the technology, for example through subsidies, this should mainly be done in the initial 'transition period', as many people are unwilling to be one of the first to buy a self-driving car, due to their fear of a mix of self-driving and human driven cars on the road. This is already the case with many technologies, but might be even more true for autonomous vehicles. Financial incentives could possibly compensate for this. Expert 1 stated that although indeed many people have these concerns, but that he does not see the fear of this transition period as a major obstacle, as only a minority is required initially to create a user base.

From the perspective of the automotive industry it becomes clear that there is still a lack of a clear image of the technology for many people. Car manufacturers should therefore try to improve the awareness of the advantages of self-driving cars through advertising and marketing campaigns, since many people do not know about these benefits well enough. Manufacturers should also be transparent regarding the safety of autonomous vehicles, which is something that Google for example already does, by sharing the amount of kilometers tested (Waymo, 2017). Working together with government instances could help in increasing people's trust regarding the safety of the cars. Giving live demonstrations could also help in this regard, as it allows people to experience the technology firsthand. All experts asked agree that demonstrations are indeed an important way to increase awareness, and that the government currently already facilitates this. An example of this are the WEpods, with which Expert 1 is directly involved. Experts 1 and 2 also state that advertising and marketing campaigns are of more use when the technology is already available for purchase, and that therefore demonstrations seem to be the best option.

Manufacturers cannot start early enough with these things, as starting these initiatives before the introduction of the cars will only make sure that people get used to the technology. Another way to familiarize people with the technology is by introducing the functionality in steps. An example of this is the fact that some manufacturers are already implementing features such as 'adaptive cruise control' and 'lane-keeping' (Volvo, 2017). In the same way, the results of this research show that manufacturers should keep equipping cars with a steering wheel and a 'manual driving' option initially, even if this might not be necessary in a level 4 automated vehicle, as people value the pleasure of driving. Expert 1 stated

on this topic that he believed that the automotive industry has always been evolutionary in nature, and that it is likely that autonomous features will be introduced into current cars step by step. He also indicated that designing a car to be autonomous from the ground up turned out to be a better solution in their project, compared to adapting an existing vehicle. This means that the suggestion made by one candidate to make plug-in autonomous features might not be ideal.

Taking all these implications and expert views together, it becomes clear that the Dutch government in particular is clearly already aware of the technology and its potential to replace regular cars on the road, and that steps are already taken to ensure a smooth transition. However, since there is much uncertainty and since level 4 autonomy is currently still not ready, the step taken still happen on a relatively small scale. The same can be said for the automotive industry, who seems to be waiting for the technology to become closer to reality before upscaling its efforts. Nonetheless, the results found here confirm the approaches that are already taken, and can help in taking more 'concrete' actions when the technology is further developed. New implications were still found however, as it can be argued that the creation of awareness of benefits is something that is currently not done sufficiently yet, and that this might be interesting for car manufacturers to work on before the introduction of these vehicles

6 Conclusions, Recommendations & Reflection

6.1 Conclusions

In this report the issue of user acceptance of self-driving cars, and the gaps in the knowledge on this topic were looked at. During this research, not only the factors that play a role in people's acceptance were taken into account, but also the implications of these found factors for the national government and the automotive industry. First, the following research question was answered:

Which factors and their underlying reasons play a role in the user acceptance of self-driving cars?

The factors found to play a role during the interviews were put into two categories; personal and technological factors. Technological factors in turn were split up into benefits, drawbacks, and general factors. Besides confirming the existence of these factors, the reasoning candidates gave for their importance were also elaborated on, making this research go further than existing literature. The findings from the interviews were then compared with a table given to candidates at the end. The results showed that although candidates expressed a generally positive sentiment towards self-driving cars, they referred to the negative aspects of the technology more frequently than the benefits during interviews. Surprisingly enough, this is less apparent in the responses given by the candidates to the table, where many benefits are ranked as important more often. The difference in these results suggests that many people are simply not aware of many of these benefits, which could positively affect their acceptance. This is further strengthened by the fact that many people claim to not know much about the technology, making it difficult for them to form a well-informed opinion on the topic. This in turn suggests that the media could play a big role in shaping the opinions people have on self-driving cars, although only few candidates claim that this plays a role.

Another key finding is that many candidates claim to be uncomfortable with the so called 'transition period', in which a mix of self-driving and non-self-driving cars will be on the road at the same time. This concern, whether justified or not, could make initial adoption of the technology even more challenging than for the average high-tech product, as many people think this mix could make things even more dangerous. Interesting about this factor is that it has not been found in existing literature.

Based on these findings, and suggestions made by interview candidates on implications for the government and automotive industry, an answer could be formulated to the second research question:

What are the implications of improved knowledge on user acceptance for the automotive industry and governments?

The main answer found, naturally following from the answer to the first research question, is that both the government and the automotive industry should focus on increasing the awareness of the existence of many of the benefits of self-driving cars, which can be done best through demonstrations. For the government, it is further recommended to mainly prepare for the market introduction of this technology in terms of regulations, ethical dilemmas and infrastructure, as the generally positive sentiment towards the technology and the rapid technological developments suggest this to be a matter of time. Finally, the government is recommended to look into the potential subsidization of self-driving cars, especially in the initial phase, as a way to stimulate the adoption of the technology. This might be necessary, due to the fear of people for the so called 'transition period', in which a mix of self-driving cars and non-self-driving cars will be driving on the road simultaneously. One expert however thinks this might not be a major issue.

For the automotive industry, the main recommendation made is to focus on improving the image that people have of self-driving cars, and to specifically increase the awareness of the benefits that autonomous vehicles offer. On top of that, manufacturers are recommended to be transparent about testing, and to work together with the government in order to increase people's trust regarding safety. One expert also stated that tests on the open road could not only be valuable for their primary purpose of improving the technology, but could also be seen as demonstrations of the technology. Finally, car manufacturers are recommended to start early with increasing awareness and to also emphasize safety, in order to give people time to get used to the technology. Another way to get people used to self-driving cars, is by introducing self-driving features to cars step by step. This would gradually increase people's awareness and acceptance, and would receive less resistance than a fully self-driving car without a steering wheel would encounter.

By including the role of these stakeholders, and the implications of the results for both the government and the automotive industry, this research goes further than existing literature which has not looked at this before.

6.2 Limitations

One limitation is that a result of the open questioning method used in this research, some interesting topics may have not been discussed, as they were not brought up by the candidates themselves. The fact that the sample of 35 candidates is relatively small, especially for a methodology in which open questions are used, also means that many factors may only be mentioned a couple of times, making the results in this report difficult to generalize. This is also the case because of the specific target audience that has been selected for this research, which may have created a bias in the results.

Another limitation is that many of the conclusions in this research are derived from the differences in results between the two methods (open questions & table of factors). These differences might also partially be the result of small errors in the methodology, such as the way in which questions were asked during the interview, or the order of the factors presented in the table.

Another interesting point that has not been addressed in this research is that some factors could be considered to be prerequisites for acceptance, while some other factors might just be considerations, which do not 'make' or 'break' people's opinion on self-driving cars. The importance of factors can be extracted from the number of mentions, and the way in which candidates referred to these factors during the interviews however.

On top of that, the fact that many people appear to not have a clear image of the technology as a whole shows that it is difficult to get conclusive answers from interview candidates, and that they have not put much thought into the consequences of the technology yet. As a result, getting a clear overview of the important factors is difficult as it might be too early in the development cycle of the technology.

Finally, as a result of the fact that many people automatically assumed self-driving cars to be electric, it was difficult in this research to clearly look into the ecological impact of purely self-driving technology. Although it is likely that many self-driving cars will indeed be electric, these are separate technologies.

6.3 Recommendations for future research

Based on the limitations, a number of recommendations for future research can be made. First of all, it is recommended to conduct similar interviews that target a different audience, in order to assess whether awareness of specific factors differs between various target groups, as this information could be valuable for the automotive industry in their marketing efforts.

Second, it is also interesting to further look into effects of the chosen methodology on the results, as this has shown to play a significant role in the factors selected to influence acceptance.

Third, the lack of knowledge many people have of the technology also suggests that people's acceptance can still be influenced quite easily. Therefore it might be interesting to look into the effects of framing on the user acceptance, and the effect that the media can have on the user acceptance of the technology as a result of framing.

Fourth, future research could look into whether factors can be seen as prerequisites for acceptance, or whether they are considerations. As mentioned in the limitations section, although the importance can be derived from the results in this research, this has not been explicitly looked into.

Finally, the effect of the impact on the environment on user acceptance should be looked at in further research, as it has not been considered in this research. When looking into this factor, it should be made clear that the ecological benefits of purely the self-driving technology are looked into, and that the benefits of electric vehicles are a separate issue.

6.4 Reflection

I think that the results of the interviews are very interesting, and that some interesting conclusions can be drawn from them, but that it has proved to be difficult to clearly pinpoint influencing factors. A lot of effort was put into not influencing the responses received during the interviews, but here and there the questioning might still have done so. The small extent to which this may have occurred however means that the results can still be considered reliable. Many of the factors identified are quite straightforward, and not many interesting things are said about these factors by the candidates. Nevertheless some interesting factors, such as the transition period came forward, which were not that clear beforehand.

A Interview Protocol

Opening

Thank you for doing this interview. As you may know, I am currently doing my master thesis, in which I am researching the topic of user acceptance of self-driving cars. Getting a good overview of all the factors that play a role in this is important for the successful market introduction of this technology. All the interview results will be handled anonymously and your name will not appear in any report or presentation. Your openness in this interview is appreciated a lot as it could really help me in my research.

Ask for name, age, possession of driver's license.

I am very interested in this topic as it is a very new technology that could completely change the way in which our infrastructure will be used and how we move about, but it all depends on whether people will accept it or not. Because of that, I want to ask you some questions about self-driving cars.

Interview questions:

1. *Tell me what you know about self-driving cars. What do you think of the technology?*

Notes

Prompts:

- levels of automation
- Benefits
- Problems
- Safety
- Attitude towards the technology

2. *Do you personally believe self-driving cars are the future? How do you see the future of road transportation? How soon?*

Notes

Prompts:

- Car sharing

3. *Imagine it's 2030 and you're looking to buy a new car. Would you consider a fully self-driving car? Why (not)?*

Notes

Prompts:

- Trust. (Would having a steering wheel change so you could take over change anything?)
- Any of the pros or cons listed below / factors in table 2.2
- Network effects (mix of partial vs full autonomy)

Topics to discuss if they come up:

- Pleasure of driving
- Ability to do something else while driving
- Feeling comfortable with the technology
- Social influences (media, word of mouth etc.)
- Economic costs
- Better mobility for kids, elderly, drunk people etc.
- Ethical issues
- Transition period (not all cars autonomously driving yet)
- Anything from the table below

Ask for these things if they are a big enough issue to convince you to buy or to stop you from buying a self-driving car.

4. *How do you see the role of the government in the introduction of the technology? What should car manufacturers do to make it more attractive?*

Notes

Prompts:

- 5. *If I give you this list of factors, could you identify which ones you deem to be most important for me? (from 1 to 5) If you need clarification on any of the factors just ask me.*

Notes

Prompts:

| | Factors playing a role in acceptance |
|---|--|
| A | Safety |
| B | Social influence by media |
| C | Social influence through word of mouth |
| D | Ability to use time more effectively |
| E | Enhanced mobility for elderly, young, or impaired (drunk people, etc.) |
| F | Ability for car sharing |
| G | Decreased traffic congestion |
| H | Hunting for parking eliminated |
| I | Higher speed limits |
| J | Comfort with the technology |
| K | Ease of using the technology (navigating, configuration, etc.) |
| L | Pleasure of driving |
| M | Type of traveling (roadtripping or commuting to work) |
| N | Ethical issues |
| O | Costs (Economically) |
| P | Loss of jobs (taxi/truck drivers) |
| Q | Loss of privacy |
| R | Amount of self-driving cars already on the road |

1. _____
2. _____
3. _____
4. _____
5. _____

Ending:

That was all. I would like to thank you for your participation in this interview. The next step for me is that I will summarize the findings of this interview briefly and send this to you via email for approval. If you do not reply within 14 days I will assume you are ok with my summary, but please do reply anyway. After you've done that I won't ask you for anything else anymore, so thanks again!

B Interview with experts protocol

User acceptance of autonomous vehicles

Jens Kaan

Structure interviews

- Try to find factors influencing user acceptance and based on that
 - Implications for the government
 - Implications for automotive industry / manufacturers
-

Methodology

- 35 interviews conducted with young people aged 18-40
 - Specifically Level 4 (human intervention not necessary)
 - Open questioning, candidates have to bring up the factors themselves
 - Afterwards table with previously identified factors was given and candidates were asked to rank their top 5 most important factors.
-

Important factors

- Safety
 - Ethical issues
 - Price
 - Decreased traffic congestion
 - Transition period (from regular to self-driving)
 - Ability to spend time on other activities
 - Ability to drive manually
-

Findings/conclusions 1/2

- People are not aware of many of the factors, mostly advantages, because they are not mentioned in the open questioning. In the table they are mentioned more often after people have been confronted with them.
 - Role of the media bigger than many people think, since almost everything they know is about the big projects such as the ones from Google, Tesla, Uber, Apple.
 - Only 3 out of 35 people really have a negative view of the technology, others are neutral to positive. Nonetheless problems such as safety and ethical issues are often named. This suggests that many people think these problems will be solved and will not be a big issue in the future.
 - Many people say they do not feel comfortable with the so called 'transition period', in which self-driving and non-self-driving cars are both on the road. Many people think this is more dangerous, while this is not necessarily true.
-

Findings/conclusions 2/2

- Driving pleasure was often mentioned in open questioning, but was rarely seen as important in the table. This might be because the factors people weren't aware of in the open questions turn out to be more important for them when confronted with it.
 - Despite the fact that price was considered important by many, a large number of people was willing to pay slightly more (10/20%) for a self-driving car. Often because people said they could then do other things while driving.
 - 8 Different people thought they might never have to by a self-driving car, because you might rent and share them instead, or that they will take over a public transport function.
-

Implications government

- Stimulation especially needed in initial phase because of discomfort with transition period. Now too soon however because level 4 cars are not yet there.
 - Because people are positive in general, government should prepare for situation when these cars are coming, since it is likely to happen.
 - Government should set up tests similar to current crashtests, which determine the level of autonomy and whether the car is allowed on public roads
 - Also build a framework of requirements which cars should further fulfill, so that not all cars of different brands function completely differently.
 - Regulations adapted in time and ethical dilemmas that might arise should be addressed in time.
-

Implications automotive industry

- Mainly try to create a clearer image of what a self-driving cars entails by promoting it, and showing all the benefits of it. Manufacturers should start early with this to get people used to it by the times the cars hit the market.
 - Car manufacturers should be transparent in terms of safety during testing to make people feel more comfortable (Google, Tesla, already doing this by showing amount of km's tested and making crashes public).
 - Not just advertisements, but also do real life demonstrations of the technology in order to increase trust and allow people to experience it.
 - Introduce technology step by step such as lane-keeping systems now, and slowly build it up to level 4 automation. Also keep steering wheel initially even if it is technically not necessary, because people value driving pleasure.
-

Recommendations for future research

- Conduct similar research with different target audience.
 - Look into effects of the methodology on the answers given.
 - Since many people still don't have a clear view, look into the effects of framing of the topic on user acceptance.
 - The environmental impact has not been considered as a factor in the current research, because many people automatically assumed self-driving cars to be electrical. By making this distinction more clear it could be looked at in future research.
-

C Coding of interviews

The coding in this appendix is copied from an Excel document. In this Excel document, which is slightly easier to read. This Excel can be sent upon request.

| Perceived safety (PS0) | 16/7/3 |
|--|--------|
| I believe that a self-driving car is safer than a human driver | IC2 |
| Maybe it will decrease the number of accidents happening in the city. Safety is the most influential feature that would make me pay more for this car. | IC3 |
| Also reliability is an issue. Maybe something fails and the car doesn't respond | IC4 |
| Als je kijkt naar het aantal kilometers dat ze rijden op het aantal ongelukken denk ik niet dat ze het slechter doen dan menselijke bestuurders. Het is veiliger dan mensen die normaal rijden | IC6 |
| If they don't have those sensors I think it's dangerous, because if a bike is passing maybe it couldn't sense it based on just the motion. | IC8 |
| If it's safe I would like to use it | IC9 |
| You don't have to market the safety, it should be assumed safe. | IC10 |
| Being the safest choice, we should move towards this choice. | IC11 |
| Mix zou me niet weerhouden als het wel gewoon veilig is | IC12 |
| Technologically it's really cool, I saw a video in which is prevented an accident and I didn't think it was that far already. | IC14 |
| Safety, I don't know the numbers, but I think a lot of people die on the street, mainly because of people not paying attention. So hypothetically if we all use self-driving cars the number of crashes drops. People are the weakest link. | IC16 |
| Being a person who doesn't like drive, and I find it very stressing, especially in my city or in Colombia, the road quality is the best, there are a lot of bad drivers, I think it would be very interesting in using a car where I don't have to worry about these problems. | IC17 |
| Safety does not depend just on you, but also on the car, so it would really need to be proven. | IC18 |
| Dan haal je alle risico's van dronken rijden weg, slapeloosheid weg. | IC19 |
| If there are a lot of self-driving cars maybe we can avoid these crashes. | IC20 |
| Ik heb wel een filmpje gezien dat de auto al afremt voordat de bestuurder het ziet, dus op zich is het wel goed natuurlijk. Het is op zich wel positief natuurlijk, omdat je veiligheden in kunt bouwen, maar helemaal zelfrijdend vind ik nog best wel een dingetje | IC22 |
| Aan de ene kant is het wel mooi dat het kan met de technologie, maar ik denk wel dat het in sommige situaties niet verstandig is, omdat de computer niet altijd ter vervanging van menselijke reactie kan werken. | IC23 |
| Actually, I have a really positive view. I think they can do way better than us. | IC24 |
| Because safety is not from the commercial firms only, but it should also be part of the responsibility as the driver, and safety should also be given to the environment outside of the car. So I think we should all work together to create safety. | IC25 |
| Maak me er niet veel zorgen over, denk dat ze relatief veilig zijn. | IC26 |
| Because there are unexpected situations while driving, and I think the system cannot deal with this. | IC27 |
| I also don't believe in humans that much because they make mistakes, but also the machine is not perfect, also it can be easily hacked, and then it might cause even bigger accidents. | IC28 |
| I would feel happy to adapt, but I would be critical if you hear the first accidents happening, then I would be more critical. | IC31 |
| Ik vraag me altijd of in hoeverre een auto beter kan zijn dan mens in autorijden. Ik denk dat op den duur er minder ongelukken door kunnen komen | IC33 |
| Ik heb het idee dat het meestal gewoon goed gaat. | IC34 |

| | |
|--|---------------|
| Positieve vooruitgang. Snelheidsboetes zullen minder worden, omzet openbaar vervoer. Minder banen vanwege taxichauffeurs die overbodig worden. Fileprobleem zal worden opgelost, minder kans op ongelukken. | IC35 |
| Transition period (PS1) | 2/3/11 |
| I don't want to in the minority on the road as a user of self-driving cars. | IC1 |
| Then, probably if all the cars are self-driving it will be way more safe | IC2 |
| If you consider that the total market are fully substituted by self-driving cars, it would become an alternative. A combination is a more compromising solution. | IC4 |
| In principe is computer beter dan mens, aan de andere kant als je als zelfrijdende auto tussen niet zelfrijdende auto's rijdt, sommige mensen zijn heel onvoorspelbaar. In hoeverre kun je dat als zelfrijdende auto opvangen. Grootste probleem is denk toch de mix tussen zelfrijdende auto's en niet zelfrijdende auto's. | IC5 |
| Je moet sowieso nog rekening houden met voetgangers, fietsers etc. dus dat is helemaal geen probleem | IC6 |
| How can self-driving cars and people driving cars go on the same road, it could be a problem | IC9 |
| Transition phase will be until we can prove that self-driving cars are far away more safe. Mix on road could always stay | IC11 |
| Zelfrijdende auto in het verkeer zoals het verkeer nu is zou ik niet optimaal vinden, zeker niet in een mix met gewone auto's nu. Mix zou me niet weerhouden als het wel gewoon veilig is | IC12 |
| Vraag is niet of mensen het gaan accepteren, maar hoe de mix is zelfrijdende auto's en niet zelfrijdende auto's. Mensen zijn wel geïnteresseerd, maar communicatie over hoe je kan ingrijpen in een niet zelfrijdende auto met zelfrijdende auto's zou duidelijk gecommuniceerd moeten worden. | IC13 |
| It's strange because there will be this transition period in which some cars are self-driving some cars are not, so that will be difficult to manage. Then who is responsible etc. ethical problem. Because I think it is very difficult to regulate a mix of self-driving and manual driven cars. | IC16 |
| If all the cars are self-driving I think it would be safe, I would trust it, but if I am one of the few persons that my car is driving itself I wouldn't want it because I might think I am able to see something faster. | IC18 |
| Als alles zo is dan is het misschien wel goed, maar als de helft wel zo is en de helft niet dan werkt het ook niet. Dan moet je een speciale rijbaan voor zelfrijdende auto's. | IC22 |
| The thing is that I wouldn't trust it right now, because other cars are not using the same systems. So if the driving belongs to human actions and decisions anything can happen to my car that is self-driving. I would trust it completely if at least some percentage of cars is doing the same, but not if it's just me. | IC24 |
| If it's well designed, I wouldn't mind other people on the road using self-driving cars. | IC31 |
| And probably it also needs to be compatible with other cars to handle uncertainty. | IC32 |
| Ik dacht vroeger dan moet alles zelfrijdend zijn en dan werkt het pas, maar nu las ik dat ze eigenlijk ook beter met het verkeer kunnen omgaan dan de mens. | IC33 |
| Perceived trust (PS2) | 0/5/9 |
| I might trust it when there's enough empirical research results. | IC1 |
| First I would like to see some numbers | IC2 |
| I would have to see the facts, but probably I would trust the technology more than my driving skills. | IC8 |
| If there are some accidents that can be proven to be the fault of self-driving car, it would delay the technology | IC9 |
| Sometimes you don't know if the technology is as fast or as capable as a human being, making it difficult to trust. | IC14 |
| Je legt je leven in de handen van een systeem, dat gebeurt nu niet zoveel. Dus ik denk dat die drempel nog hoog is. | IC15 |
| Ik denk dat ik wel aan de snelle kant zit dat het geloof, maar ik wil wel dat er significant veel testkilometers gemaakt zijn. | IC19 |
| Als zo'n Google of zo'n Tesla al miljoenen kilometers autonoom met dat ding op de weg heeft zitten, dan hoef ik dat niet per se te zien bij iemand die die auto heeft, en dan geloof ik wel dat dat gedaan is en dat dat klopt. | IC19 |
| I would see how many people have this car, if it is already working and has been tested. | IC20 |

| | |
|---|------|
| Aan de ene kant is het wel mooi dat het kan met de technologie, maar ik denk wel dat het in sommige situaties niet verstandig is, omdat de computer niet altijd ter vervanging van menselijke reactie kan werken. | IC23 |
| I think in The Netherlands I would trust it more than in Italy. | IC24 |
| Because there are unexpected situations while driving, and I think the system cannot deal with this. | IC27 |
| Obviously it's quite cool, but I am a bit nervous as well, because I believe in myself more than a machine. So if there's a problem with the machine, I am a bit afraid of it. I also don't believe in humans that much because they make mistakes, but also the machine is not perfect, also it can be easily hacked, and then it might cause even bigger accidents. If I choose not to buy it there would be only one reason which is it being risky. But that's not a big deal actually if they made trial and errors before and they are sure about it that's fine. | IC28 |
| I don't trust it yet, I don't think it's mature enough, probably when the technology is more developed and they have like a solution for the ethical problems. | IC29 |
| Uncertainty is actually when you talk about self-driving cars, this is what I would say, you can lose your life by driving, why to trust the computer to do the job for you. | IC32 |
| Mensen hebben veel vertrouwen in zichzelf dat ze denken dat ze zelf beter ongelukken kunnen voorkomen, zeker oude generatie zijn bang voor veranderingen. Snappen misschien ook niet zo goed hoe het werkt. | IC34 |

| | |
|---|--------------|
| Social Influences (SI0) | 0/7/2 |
| | |
| | |
| Ik denk dat het een beetje kuddegedrag is, dus als iedereen dat op een gegeven moment gaat kopen dat je je er dan makkelijker aan toegeeft. Als je er meer van ziet of meer mee in contact komt dat het makkelijker wordt | IC15 |
| Maybe it also depends on the reputation, like hybrid cars had a reputation for weird guys in the beginning. | IC16 |
| Yeah I think more penetration means you can make the inference that it works better. Now it would be too experimental for me to try. | IC17 |
| I would like to see everybody using it, but it's difficult because now not everybody wants it and people only want it if everyone has it. Also how popular it is, because every innovation at the beginning there are a few people. | IC18 |
| If more people have it, then I will buy it. I wouldn't be one of the first, I'm a technology enthusiast. | IC20 |
| Dat ligt er volledig aan wat op dat moment de standaard is. Als dat wel zo is dan wel, als dat niet zo is dan niet, ik ben wat dat betreft gewoon een kuddedier. | IC22 |
| The point is to get the people who are more connected to the population to get started with this technology. If car manufacturers aim at well-known people or people who have certain position in society. | IC24 |
| Yeah I would consider buying it if it's a trend (even if it's more expensive) if you compare to using a smartphone, at first it was very new but now everyone is using it. | IC27 |
| Als dat het straatbeeld is dan wel. | IC35 |

| | |
|--|--------------|
| Social influences: Media (SI1) | 0/1/2 |
| | |
| And also media could stop me from buying it | IC1 |
| I think the media do a lot in terms of expectation. | IC16 |
| Ik sta er positiever tegenover dan de media het schetst. | IC34 |

| | |
|--|--------------|
| Social influences: Word of mouth (SI2) | 4/2/2 |
| | |
| Also the feedback from the users that's going to be important. If I hear reliable feedback which is very negative that will stop me. | IC1 |
| Yes I think the opinions from other people are the biggest part. If you hear it's good | IC2 |

| | |
|---|------|
| If I see so many people around me are using it and they have good experiences and it makes life easier, it could affect me | IC3 |
| Sure I know what I see on social pages and from word of mouth of my friends | IC10 |
| Because of network externalities and others telling me how cool it is. | IC14 |
| Ik denk dat het wel tegen gaat vallen (hoe lang het duurt), want ik denk dat er toch een bepaalde angst heerst, tenminste onderling, dat mensen elkaar bang maken. Je stapt ook niet zo snel in een vliegtuig zonder piloot. | IC15 |
| No one will accept the technology if they don't see people around them accepting it themselves. If all my neighbors are still with their cars why should I switch mine. Convincing me to buy this technology, if some guys tells me it's ok. But if I really see my best friend using it I would be more willing to buy it right. | IC24 |
| Trust and what you would hear from other people about the experience and the car itself. So if you know someone who has an autonomous car and he has good feedback about it. | IC31 |

| | |
|--|--------------|
| Perceived usefulness (PU0) | 1/1/0 |
| I think it depends on where you use it, like highway or small cities | IC3 |
| It is quite a useful technology | IC4 |

| | |
|---|---------------|
| Perceived usefulness: ability to spend time on other activities (PU1) | 21/0/0 |
| If I don't consider safety and things, I would prefer the self-driving car, because I could spend my time differently | IC1 |
| People would enjoy more not driving but doing something else | IC2 |
| When you are driving a trip for 4 or even 5 hours, because the driver doesn't have to pay as much attention | IC4 |
| Het levert tijd op die je nuttiger kunt besteden natuurlijk, dat is ook wel wat waard | IC5 |
| Ja als zo'n auto dingen bied als een bureau-achtige omgeving zelfs zou dat zo veel tijd schelen | IC6 |
| You are in the car, and you don't have to worry about anything. | IC8 |
| The main advantage is that you should see driving a car no longer as a waste of time. | IC10 |
| If in my drive to work I can save some time by already working. Would prefer a car that doesn't even have shape or structure of regular car, so that it can be optimized for the people who are inside, like a small living room or working space or something. | IC11 |
| Alleen extra betalen als het ook echt voordelen heeft, zoals niet op de weg letten. | IC12 |
| Als ik met een zelfrijdende auto zou kunnen werken tijdens de file, dan haal je de investering eruit. | IC13 |
| It's pretty cool to be able to drive and relax at the same time. | IC14 |
| Niet meer hoeven opletten. | IC15 |
| Stel je draait je stoel om en je kan gewoon iets anders gaan. | IC19 |
| If you are in a traffic jam and you can do other stuff, then yeah if the car costs the same why would I not use this. | IC20 |
| Als ik vaak op de weg zit zou ik er zeker extra voor betalen, omdat je ook tijd over kunt houden. | IC21 |
| But then of course if you can just enjoy more your family trip then this becomes valid for everyone, so yes I think it's the future. | IC24 |
| Driving experience vooral belangrijk. Voordeel is werken tijdens rijden. | IC26 |
| Then you can talk and do other things, free my hands, things like that. | IC29 |
| The 50/50 experience I think I would like it more, so I can take a nap and be able to continue when I want. | IC31 |

| | |
|---|------|
| Ik zou het ook wel weer mooi vinden als je gewoon je zelfrijdende auto hebt die 100% zelfrijdt, dat je gewoon lekker naar buiten kunt kijken in mooie gebieden. | IC33 |
| Je kunt gaan werken in je auto. De auto rijdt, dus je kunt andere dingen doen. | IC35 |

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| Perceived usefulness: Enhanced mobility for elderly/young/impaired (PU2) | 4/0/0 |
| Nearsightedness, mental stress, fatigue due to inability to stretch legs not an issue with a self-driving cars. | IC7 |
| Or if for any reason I have some type of disability that won't allow me to drive for 100%. | IC8 |
| I think that it's good for old people too, because they can drive the car at an older age. | IC25 |
| In extreme issues, for disabled people or colorblind people who are not allowed to drive, this gives them a chance. | IC29 |

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| Perceived usefulness: Car sharing (PU3) | 9/0/0 |
| People for us will buy cars in the future. Also the way in which cars are sold and the mentality behind purchasing cars. Companies will buy cars and we will rent them | IC10 |
| Maar niet exact op de wegen die er nu liggen 1-4 persoons auto's. Ik denk dat er eerder per dorp 30 grotere auto's staan. | IC12 |
| I think other trends will also appear. Like carpooling where people will just step in a car when they come by. | IC17 |
| Instead of owning a car, renting a car as a service in the future. | IC20 |
| Als ik denk aan een autonome auto, ja dan hoeft die niet eens van jezelf te zijn, dan hoeft je hem niet eens meer te kopen. | IC21 |
| Kan ik een auto delen bijv, hoe doe ik dit alles. Wat ik denk dat het de kant opgaat dat je allemaal zelfrijdende auto's krijgt die je gaat gebruiken zoals je nu de trein gebruikt (commuting) | IC26 |
| I think it's going to be more like that, like for example a taxi with no more driver that you call and it picks you up. | IC28 |
| Then you do not need private cars, you could have I don't know self-driving buses, then it becomes public transportation actually. If I have a self-driving car I don't know why I would use it instead of the bus for example. | IC32 |
| Wat ik als groot voordeel zie dat als je ergens in de stad bent met studenten ofzo en je hebt een zelfrijdende taxi bijvoorbeeld, dus echt de commerciële applicaties ervan, daar zou ik heel blij mee zijn. En wat je vaker dan zou kunnen doen is een soort car sharing maar dat is weer een heel ander verhaal. | IC33 |

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| Perceived usefulness: Decreased traffic congestion (PU4) | 6/0/0 |
| And maybe there's no traffic anymore | IC3 |
| Yeah traffic will be optimized because you don't have those human factors that you have to react, traffic lights, hitting something. | IC17 |
| Aan de ene kant denk ik dat het een oplossing is voor specifieke problemen in de verkeersdrukte die we nu al hebben, waarbij als het allemaal met elkaar kan communiceren dat het dan ook wel degelijk kan werken. | IC21 |
| Most of the traffic jams are caused by humans. | IC25 |
| En als het betekent dat je sneller op je werk bent, dat je een perfecte verbinding hebt in de randstad, nooit file, dan zou ik er absoluut voor zijn. | IC33 |
| Positieve vooruitgang. Snelheidsboetes zullen minder worden, omzet openbaar vervoer. Minder banen vanwege taxichauffeurs die overbodig worden. Fileprobleem zal worden opgelost, minder kans op ongelukken. | IC35 |

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| Perceived usefulness: Hunting for parking eliminated (PU5) | 1/0/0 |
| Dat hij ook bijvoorbeeld zichzelf kan parkeren als je er niet inzit. Dat je hem altijd bij je kan hebben. | IC33 |

| Choice between autonomous and human driven (PoD3) | 9/2/4 |
|---|-------|
| I think having a steering wheel would make it worse, because if the others are autonomously driven and I'm the only one driving myself who's not, then I cannot predict what the others are doing | IC1 |
| Right now, probably yes I would prefer a steering wheel for small displacements, later no | IC2 |
| I would prefer having the option also to drive it by myself. But having the choice to switch would be nice | IC4 |
| I don't think I would like to intervene, but I consider driving as a pleasure sometimes. So I would like the chance of driving as a pleasure. | IC9 |
| Having a wheel so I could use both self-driving and manual driving would be preferable. | IC11 |
| It can be a feature, but not the main thing for me. | IC14 |
| Yes, if it will be possible to still have the possibility to drive. Maybe I would go with the self-driving car if I had to choose between fully automated and fully and manual. | IC16 |
| Ik denk dat er altijd wel auto's zullen blijven bestaan die je zelf kunt besturen. Een auto met de optie om zelfrijdend te zijn zou ik zeker overwegen. | IC21 |
| Alleen als je zelf niet in kan grijpen (zou me dat ervan weerhouden), dus je let wel op, dan zou ik het wel overwegen, maar al zou dat niet gaan en de auto zou echt zelf doen wat hij wil zeg maar dan denk ik het niet. | IC23 |
| I would want to be able to switch it. If I want to drive myself I would do that, but in a road where it's safe I would switch to the automated system. | IC27 |
| I guess the self-driving car can also drive in a regular mode. | IC28 |
| But I would be happy, but not for a fully self-driving car, maybe a car you can drive but that can also drive itself, so that you still have a wheel. I don't think I would be happy for a fully automated car. If you want to drive, cause I think the experience of driving is also fun. This is also why you would want a steering wheel, because of the driving experience. The 50/50 experience I think I would like it more, so I can take a nap and be able to continue when I want. Definitely not a fully autonomous one (without a steering wheel). Having a steering wheel is quite important. | IC31 |
| Ok, maybe if there is a mode in traffic you could use for first and second gear and stopping, I would use it. | IC32 |
| Het zou mooi zijn als het allebei kon. In Nederland zou het me niks interesseren, daar is toch alles druk enzo. Maar het zou wel mooi zijn als je bijvoorbeeld ergens in Zweden ofzo op vakantie bent dat je daar dan nog wel een beetje zelf kunt rondtoeren, dat je wel het idee hebt dat je zelfrijdt. | IC33 |
| Het hangt wel een beetje van de situatie af. Ik zou het wel leuk vinden als je kunt kiezen. Ik zou het bijvoorbeeld super chill om in de polder te kunnen rijden, en op de snelweg chillen. Maar ja uiteindelijk zou het natuurlijk het meest handig zijn als alles autonoom rijdt. | IC34 |
| Dat denk ik wel al hoorde ik laatst iemand die zei dat het nooit helemaal in handen van de techniek zou kunnen zijn, maar dat betwijfel. Ik denk dat mensen nu zouden zeggen dat je nu nog wel een stuur zou willen, omdat mensen het nog niet helemaal vertrouwen, maar met de tijd zou dat misschien veranderen. Eigenlijk zou het niet nodig moeten zijn. (stuur) | IC35 |
| Perceived Ease of Use: Comfort with the technology (PEoU1) | 1/1/9 |
| It is something I cannot really relate to yet, in that way I don't really like it Zou het niet fijn vinden als ik erin zit en niet zou kunnen ingrijpen. Hoeft niet eens volledig stuur en pedalen te zijn maar wel kunnen ingrijpen. Controle gaat meer om gevoel dan om veiligheid | IC3 |
| Technology sounds cool, but I wouldn't feel 100% comfortable | IC7 |
| I don't know if I'll be comfortable. It will be strange, the first time will be uncomfortable, but you will get used to that, so it won't be an issue. | IC16 |
| Ik heb wel een filmpje gezien dat de auto al afremt voordat de bestuurder het ziet, dus op zich is het wel goed natuurlijk. Op zich, als je dat filmpje ziet, vind ik het wel een geruststellend gevoel. | IC22 |
| Het lijkt me wel heel apart. Je zit en je rijdt mee met de auto. | IC23 |
| I think to a certain extent that there should not be a 100% loss of control from the driver. Because safety is not from the commercial firms only, but it should also be part of the responsibility as the driver, and safety should also be given to the environment outside of the car. So I think we should all work together to create safety. | IC25 |

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| Ik denk dat voor mij echt het verschil gaat zijn hoe comfortabel is het voor mij om in die auto te zitten. Als ik toch in die auto moet zitten wat moet ik dan doen en hoe prettig is dat. | IC26 |
| I would be not so comfortable leaving everything to the car. | IC30 |
| I would like to be able to have this sense of control of the car. | IC31 |
| I would certainly want to be able to take control of the car whenever I want to. I would never go into a car that I don't have control of. | IC32 |

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| Ease of Using the technology | 0/1/1 |
| Het moet wel heel gebruikersvriendelijk zijn | IC5 |
| Old generation might think it's too complex | IC7 |

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|---|---------------|
| Pleasure of Driving (PoD0) | 10/5/6 |
| I enjoy the experience of driving, but it's not that important to me | IC1 |
| I am someone who enjoys driving. I like the enjoyment of it | IC4 |
| Rijplezier is voor mij niet heel belangrijk | IC5 |
| New generation might enjoy driving which is why they might not accept it, like me | IC7 |
| People will never give up driving cars because it is so cool. What would stop me is the fun part of driving | IC11 |
| Ik hoop dat het nog heel lang duurt omdat ik heel erg hou van zelf rijden. | IC13 |
| For me personally driving is also fun. And also loss of driving pleasure would be a major factor for me. | IC14 |
| Ik denk dat er altijd nog mensen zijn waarvoor autorijden een hobby is en ik denk dat die vraag er altijd zou blijven. Niet per se voor mijzelf | IC15 |
| It will also impact people who want to drive. Me I love driving. | IC16 |
| Aan de andere kant denk ik dat de mens zelf ook wel graag de controle wil blijven behouden, ik ook zelf wel, het is altijd wel leuk om iets te besturen. Als ik een nieuwe auto heb zal ik daar ook zelf in willen rijden. Het gaat meer om plezier dan om de controle houden. | IC21 |
| Ik hoef niet per se auto te rijden, ik laat (mijn vriend) ook vaak rijden. (rijplezier niet belangrijk) | IC22 |
| Mijn interesse ligt er verder ook niet, ik bestuur hem liever zelf. Ja de lol raakt er anders een beetje af, van het hele autorijden. | IC23 |
| I'm a beginner driver, for me especially in a country like The Netherlands, traffic is very crowded, and there's not just cars, but also a lot of bicycles. As a beginner, you feel scared at the cross-section. | IC25 |
| Voor plezier manueel rijden. Plezier van rijden is geen belangrijke factor. Rijden op zijn tijd leuk maar niet heel belangrijk. | IC26 |
| I think some people enjoy driving cars, so they will not fully accept this. Actually I'm not one of these people. | IC27 |
| Having no steering wheel would be an issue, because sometimes I really enjoy driving. | IC28 |
| I think it's cool for normal people, but people who enjoy driving, I don't think they will like it, because they will feel like they are not in control and that's why they drive. Not really much (enjoy driving), but also I don't have much experience with driving. But when I was driving I preferred the manual one (gearbox). So yeah probably | IC29 |
| If you want to drive, cause I think the experience of driving is also fun. This is also why you would want a steering wheel, because of the driving experience. Especially for men you maybe also see it as toys and if you cannot drive it yourself anymore, then you cannot have your toy anymore. | IC31 |
| I have negative attitude about it, because I really love driving, and I would never make it computerized, the process of driving, even if there is traffic or. | IC32 |
| Alleen dan zit je weer met de vraag, willen mensen niet gewoon met een oude auto rijden ofzo. Ik zou het wel jammer vinden als dat helemaal niet meer kon, maar ik denk dat dat misschien ook wel weer went ofzo. | IC33 |
| En ik vind autorijden wel leuk. Weet niet of ik autorijden dan zou opgeven, zou best wel kunnen dat ik dat dan opgeef. Zeker als het heel veel tijd kost of als autonoom veel beter is. | IC34 |

| Pleasure of driving: traffic situation (PoD1) | 4/0/7 |
|---|-------|
| If you live in Istanbul and you spent three hours in traffic. Then you want to spend this time differently. But from Delft to Den Haag in 20 minutes I don't think I would use it differently. | IC3 |
| For a big trip it might be a bigger advantage than for a short trip. Would prefer to drive self on short trip, but self-driving on long trip | IC7 |
| I think it depends a lot on the type of driving. If I go through traffic in the work all the time I might consider it more than when I'm going on a vacation trip. | IC8 |
| Als ik elke dag in file zou moeten staan zou ik het zeker overwegen, maar als dat niet het geval is dan niet | IC13 |
| I would prefer it for long distance. | IC18 |
| Ik weet niet hoe ver in de toekomst en ik denk dat het heel erg afhangt van het gebied. | IC26 |
| If I have to drive for half an hour to an hour, I definitely prefer to do it myself, but if I drive for longer I probably prefer something automatic so I can rest for a while, so there's not the risk of tired driving. | IC29 |
| For shorter distances and the highway maybe. On the highway the direction is singular and it's easier that way. Shorter distances that is simple maybe self-driving. Longer distance with a lot of turns would do it myself. | IC30 |
| But if I see that it works and it's convenient yes I would use. And yes I could certainly use it for certain types of travel, such as travelling on the highway for 8 hours with the same speed. Inside the city I wouldn't use it. | IC32 |
| Hangt ervan af of ik er heel veel voordeel van reistijd naar werk van zou hebben. Stel dat ik een baan heb waar ik het heel druk heb dat ik dan wat relaxter in de auto terug naar huis kon zitten of zelfs nog kon werken, dan wel. | IC33 |
| Het hangt wel een beetje van de situatie af. Ik zou het wel leuk vinden als je kunt kiezen. Ik zou het bijvoorbeeld super chill om in de polder te kunnen rijden, en op de snelweg chillen. Maar ja uiteindelijk zou het natuurlijk het meest handig zijn als alles autonoom rijdt. | IC34 |

| Pleasure of driving: Reason for travelling (PoD2) | 0/4/0 |
|--|-------|
| Maybe if you don't drive every day the same road, maybe on holiday it's enjoyable. But everyday from point A to point B people would choose the car to drive itself. | IC2 |
| I think it depends a lot on the type of driving. If I go through traffic in the work all the time I might consider it more than when I'm going on a vacation trip. | IC8 |
| According to my lifestyle, if I use it for work or pleasure, I would buy if it adds something | IC9 |
| Als ik dagelijks naar mijn werk rijdt hetzelfde stukje dan zou ik er geen moeite mee hebben om dat niet te hoeven doen, maar als ik een rondje wil rijden of als ik op vakantie ben dan zou ik het leuk vinden om dat zelf te willen doen. | IC21 |

| Perceived drawbacks: ethical issues (PD1) | 1/1/9 |
|---|-------|
| If in a mixed situation the self-driving cars chooses to protect me better, I would choose it | IC1 |
| I know there are many problems around it, such as security & ethical problems | IC2 |
| How can you punish when someone is killed by a self-driving car | IC3 |
| Wie is verantwoordelijk? Als ik dan een ongeluk krijg kan ik dan de rekening naar Tesla sturen? | IC5 |
| Acceptance derives from an ethical perspective. Personally I don't feel this is an issue, because I rely way more on software than on people on the street, such as my grandpa. | IC11 |
| It's strange because there will be this transition period in which some cars are self-driving some cars are not, so that will be difficult to manage. Then who is responsible etc. ethical problem | IC16 |
| Met aansprakelijkheid wie er fout zit in welke situatie is alleen nog maar een computer en dat gaan mensen nooit accepteren denk ik stel je moeder wordt aangereden ja dat is tesla ja tesla krijgt een boete. Doordat je met levens te maken heb, als er iets fout gaat, mag niet de verantwoordelijkheid liggen bij dikke corporate die er niks van voelen. | IC19 |
| There's ethical issues also. | IC20 |
| Legal issues. Als je doodgaat who can you sue. | IC26 |

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| And what if some kind of accident happens, whose fault is that, is that a fault of the person or the system itself. | IC27 |
| It does come to my mind the ethics dilemma. | IC31 |
| Ja dat is wel een hele belangrijke denk ik, dat moet heel goed gereguleerd worden, zowel juridisch denk ik, van wie is er schuldig als er iets gebeurt, zelfrijdend vs niet zelfrijdend botsen bijv. | IC33 |
| Als er wel een ongeluk gebeurt, wie krijgt er dan de schuld de auto of degene die er in zit. | IC35 |

| Perceived drawbacks: Price (PD2) | 23/3/6 |
|--|--------|
| I wouldn't do so for economic reasons, because I think safety is more valuable. | IC1 |
| Let's say I would be willing to invest more in such a car | IC2 |
| Whether I would pay more for it really depends on many things | IC3 |
| Price would be a reason not to buy if it is too high. Wouldn't pay extra for it | IC7 |
| Well I think in the end it will come to price, if it is not just a plain luxury | IC8 |
| Price would stop me, but I would pay more for it. | IC9 |
| Not if I don't have the money. Would be willing to pay extra money for it. | IC10 |
| I would be willing to pay extra for a self-driving car. | IC11 |
| Alleen extra betalen als het ook echt voordelen heeft, zoals niet op de weg letten. | IC12 |
| Als ik met een zelfrijdende auto zou kunnen werken tijdens de file, dan haal je de investering eruit. | IC13 |
| I can see there's an extra functionality because sometimes you really have to drive a lot and it's pretty cool that you have this, so I wouldn't mind it as an extra feature. I think I would actually pay extra for it, but it also depends on how its updated in terms of software etc. | IC14 |
| Ik zou niet specifiek voor het zelfrijden extra betalen, dat denk ik niet. | IC15 |
| Yeah of course you pay a premium for that | IC16 |
| Nowadays I don't think I would pay extra, but in the future I hope this would be the norm. So I would expect that the prices are not so different, but yeah I would pay like a small difference. | IC17 |
| If I have safeness guarantee and long term guarantee, I would pay a bit more yes. | IC18 |
| Prijs. Die technologieën komen vaak met een prijs. Ik koop nooit als allereerst de nieuwe technologieën vanwege de prijs. | IC19 |
| Ja, zeker wel. Ik zou er wel echt wat voor over hebben. | IC19 |
| Yeah I think it will cost a bit more, because the technology is a bit more advanced. I would think it won't be that much more, so it's ok | IC20 |
| Het zal natuurlijk voor een heel groot gedeelte afhangen van de prijs. In eerste instantie denk ik dat het niet eens voor iedereen beschikbaar is, maar uiteindelijk denk ik dat het wel normaal zal zijn. Als ik vaak op de weg zit zou ik er zeker extra voor betalen, omdat je ook tijd over kunt houden. | IC21 |
| Zou niet direct bereid zijn meer te betalen voor een zelfrijdende auto, want dan moet je echt geld over hebben. | IC22 |
| Nee, dan bestuur ik hem liever zelf. Als hij daardoor 5000 of 6000 euro duurder wordt, dan bestuur ik hem liever zelf. | IC23 |
| General opinion may be that these cars have accidents easily, so maybe there will be high insurance costs. Okay yeah I would definitely buy a car like this, but let's consider the price first. Yeah I guess so, yeah it's still an investment, so yeah I think I would be willing to pay more. Yeah if the optimization of the roads and stuff brings less consumption of energy/fuel, and also an increase in personal safety, and of course an increase in easiness, then yes of course I would pay more for these services. | IC24 |
| Yeah difficult question. If it's in the future, then maybe yeah why not I would buy even if it's more expensive, knowing my own driving ability might not be good enough always. | IC25 |
| Kosten lager dan benefits dan zou ik wel self-driving kopen, dus extra betalen wel oke. | IC26 |
| Maybe if it's too expensive, I would rather drive my car by myself. If it's a reasonable price, I can buy it as an optional. | IC27 |
| It depends how much more expensive it is. If it 20-30% compared to others cars then its fine, just like the iPhone. Because I enjoy driving, so if I need to pay a lot more it doesn't make sense for me. | IC28 |

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| Generally the cost would stop me. Cause now many technology got accepted very fast because they had this policy of subsidizing. Probably would not pay more, I think cost is more important to me. Say like 10-20% more is fine, but more than that not. | IC29 |
| Price also comes in, is it very expensive to use self-driving cars. I don't actually know how the maintenance of these cars works out. People who will drive longer distances might see it as more valuable compared to short distances, so they might be willing to spend more. | IC30 |
| Could be price as well, so depending on the price. Because I like gadgets yes I would pay more, but I would still be happy for the duo option. | IC31 |
| No I wouldn't pay extra for it. But still it depends, depends if it is a lock-in or not. | IC32 |
| Ik zou wel iets extra willen betalen, maar dat is heel erg afhankelijk van hoeveel ik reis denk ik. | IC33 |
| Ja het geld, je moet het kunnen betalen. Ja zou wel bereid om meer te betalen. | IC34 |
| Als het betaalbaar is en het is veilig. Ik zou bereid zijn er meer voor te betalen | IC35 |

| Perceived drawbacks: Loss of jobs (PD3) | 0/2/0 |
|---|-------|
| Driving schools will close if technology is fully accepted, because you don't need a license anymore | IC4 |
| Positieve vooruitgang. Snelheidsboetes zullen minder worden, omzet openbaar vervoer. Minder banen vanwege taxichauffeurs die overbodig worden. Fileprobleem zal worden opgelost, minder kans op ongelukken. | IC35 |

| Perceived drawbacks: Security issues | 0/0/5 |
|--|-------|
| I know there are many problems around it, such as security & ethical problems | IC2 |
| Systemen, hoe goed ze ook in elkaar zitten, is er ook een angst dat ze gehackt kunnen worden. | IC15 |
| I would have to know it's already well developed in a responsible way, and that there are no security issues like someone can hack into the car and make it go crazy. | IC17 |
| I also don't believe in humans that much because they make mistakes, but also the machine is not perfect, also it can be easily hacked, and then it might cause even bigger accidents. | IC28 |
| Maar ook qua beveiliging als je er een kan hacken kun je ze dan allemaal hacken en kun je dan ineens op de rem trappen. Dus daar moeten wel hele duidelijke standaarden zijn, die zijn er al in het klein, maar dat moet wel heel erg goed afgeschermd zijn. | IC33 |

| Self-Perceived Knowledge of Technology (GVot1) | 2/14/13 |
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| Doesn't sound new, heard about it for 10 years already. | IC1 |
| First of all I don't know much, I know they are working on it for 10 years already. I heard of Tesla accident | IC2 |
| Heb er wel wat van gezien, was wel mooi, leek goed te werken | IC5 |
| Auto's kunnen ook met elkaar communiceren | IC6 |
| I think most companies are currently not working on it, so I don't know much | IC7 |
| I know some companies are already using some models in the market. I still don't know to what extent they are able to drive themselves or how they actually work | IC8 |
| I know few of it | IC9 |
| I'm not very familiar with the technology. | IC10 |
| Dat het inmiddels misschien al mogelijk is om te implementeren maar dat kinderziektes er nog niet helemaal uit zijn | IC12 |
| Ik weet heel veel, eigenlijk. | IC13 |

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| I don't know much about the Google one but a bit more about Tesla. | IC14 |
| Ik weet niet het grote plaatje, maar kleine dingetjes | IC15 |
| I know about Tesla, Uber, BMW. Saw some videos on YouTube on how it works. | IC16 |
| I know it's in development. I know there are 4 or 5 levels of autonomy. | IC17 |
| Ik weet van zelfrijdende auto's dat ze er dus aan gaan komen inderdaad. Ik weet dat het veel in het nieuws is, dat er veel gedoe rond is. | IC19 |
| Know it's based on the internet of things. You don't have to drive the car. Technology has advanced quite a lot, a lot of tests already. | IC20 |
| Ik heb me er zelf niet heel in verdiept. | IC21 |
| Ik weet dat ze er mee bezig zijn, dat is alles | IC23 |
| I've heard about the percentage of incidents that these cars were having, and that they were not due to technical problems, but due to other people hitting the cars themselves. | IC24 |
| I have heard that some company tested it on the road and it killed their driver. | IC25 |
| Technology wise weet ik niet precies hoe het werkt. In California mogen ze in bepaalde gebieden rijden, ook met trucks bezig. | IC26 |
| I am not familiar with the term itself. Actually I don't know that much. | IC27 |
| I know about the Google self-driving car. I'm expecting it come to the market soon so we can get it easily, like the electronic car these days. | IC28 |
| I have just heard about Google doing it and then an accident happened. They allow normal customers to do this when it's not yet allowed. | IC29 |
| Heard about it a year ago when Google tried this experiment. Apple also working towards introducing the self-driving car. | IC30 |
| Heard of platooning, | |
| It does come to my mind the ethics dilemma. Uber and Tesla also comes to my mind. | IC31 |
| Nou het eerste waar je in principe wel aan denkt is Tesla enzo, omdat het een beetje gehyped is. Iedereen denkt ook wel aan een elektrische auto erbij. | IC33 |
| Er wordt in Amerika nu veel mee getest. Er gebeuren nu nog ongelukken en dat wordt in de media breed uitgemeten. | IC34 |
| Al opdracht gedaan over zelfrijdende bus in Wageningen, in Amerika rijden ze al | IC35 |

| Role of National Government (RoNGO) | 10/22/3 |
|--|---------|
| If the government says we don't allow human driven cars anymore, I will do it but not because I'm forced but because I believe it's safer | IC1 |
| I can imagine new systems being built around it, new highways, roads, laws, etc. If it is really more safe I can imagine they will subsidize etc. | IC2 |
| The government has to provide policies to stimulate and also policies to regulate. You need to have kind of a framework behind it. | IC3 |
| In legislative level lots of changes have to happen. In terms of road construction, in terms of issuing drivers license. Stimulate investments in R&D | IC4 |
| Het moet goed getest zijn door iets soortgelijks als nu bijvoorbeeld de crashtests. Of bijvoorbeeld invoeren soort van carpoolanes voor zelfrijdende auto's. | IC5 |
| Overheid kan opleggen dat alle auto's zelfrijdende functionaliteit hebben. Wanneer ze het gaan sponsoren worden mensen argwanend | IC6 |
| Government should make giving permission to companies a global issue. If they give permission to one company the others will all be in the queue | IC7 |
| I don't think the government should do anything, unless there's an problem with too many accidents for example. | IC8 |
| If it is proved to be eco-friendly, then the government should intervene, and also if it is more secure than other cars. | IC9 |
| Technology change in this field is too powerful to be regulated. Government should use for sure an active position. Not only in regulation but also incentivization. | IC10 |

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| primarily the government should move towards this technology. Especially they control over this, with infrastructure etc. Government also has major power over it. If government tells me it's safer, this could be enabler for the acceptance and the technology. If the government keeps defensive position, it's way more difficult to trust automaker. | IC11 |
| In pure introductie een kleine stimulerende rol hebben en daarna los laten om te kijken hoe het op de markt zich ontwikkeld, en daarna een paar jaar later weer inzetten om transitie naar nieuw verkeer in te zetten. Misschien ergens subsidiëren om het een impuls te geven in de markt. Infrastructurele veranderingen, regelgeving | IC12 |
| Overheid moet onderwijzen in de techniek, dan krijg je acceptatie. Dat zou de acceptatie misschien wel met de helft kunnen verkorten, als de overheid aangeeft dat de technologie matured is en dat er geen kinderziektes meer zitten in de technologie. Overkoepelend platform komen dat er een industry standard komt. Er moet een industry standard komen van de software en dat moeten ze dan allemaal gaan implementeren, maar dat gaat denk ik niet gebeuren. Dus dan gaat de consument bepalen welke het meest gebruikersvriendelijk is. | IC13 |
| I think there are gonna be policies and regulations for it. | IC14 |
| Misschien invoeren extra rijbewijs ofzo. Of een soort van simulatie of proeflessen zodat je weet wat je te wachten staat. | IC15 |
| Regulation follows innovation. National level first, then communitarian. EU should work together so it's the same in every country. Since innovation is there, since it's already happening, government should regulate. government should give the regulation framework let's say. No I don't think the government should insist on adapting that, though it can be safer. It all depends on how this technology is managed. | IC16 |
| Yeah I think it is in the interest of the government to encourage this technology because it means that many of the functions that they do could be fulfilled by the market. For example you don't need signs with speed recommendations. So I think it's in their interest for them because it could save them money. | IC17 |
| I think it should be a teamwork. (between gov and manufacturers) | IC18 |
| Kijk, twee kanten. A, ik vind heel erg dat de overheid zich er mee moet bemoeien, want het hele rechtssysteem gaat op de schop. Daar moet echt wel vanuit een overheid een of ander slim mechanisme voor komen dat dat geborgen wordt ofzo. Dus er moet wel een vorm zijn van overheidsinmenging, dat sowieso. | IC19 |
| I think it is a trade-off. Should allow manufacturers to continue working on it. Should check what manufacturers are doing. If something happens it will be an issue for the government because they have accepted it. If someone is scared for this kind of technology they're going to blame the government. They cannot control what the manufacturers are doing but they have to regulate. | IC20 |
| Nee ik vind dat de overheid daar ook een rol in moet spelen. Landelijk of misschien wel wereldwijd moet er een peiling worden gedaan hoe mensen er tegenover staan, en op basis daarvan moet beleid worden gemaakt. Het moet niet gepusht worden, het moet wel iets zijn dat door een meerderheid gedragen en geaccepteerd wordt. | IC21 |
| De overheid moet er regels voor opstellen. Wat zou het belang zijn van de overheid om het te stimuleren, dat weet ik niet, dat is er op dit moment niet denk ik. | IC22 |
| Ik vind dat de overheid het wel aan de autofabrikanten over moeten laten, maar op zich is het wel goed om dat te stimuleren met subsidies als het echt blijkt te werken | IC23 |
| Yeah I definitely think they should be involved, mainly in increasing awareness of people, because yeah it's kind of easy to describe how a self-driving car works, but then the acceptance of people is really hard to overcome or to get. When the interest for the government is really high, they should propose giving incentives. They really have to recognize these cars, and all the dangers and the benefits they bring, and the government should do this (promote it). | IC24 |
| And if the government is transparent in how the technology is developed, by allowing that to be commercialized on the market, that means that they are actually quite ready hopefully by then. | IC25 |
| Overheid gaat belangrijke rol spelen omdat ze belangrijke regelgevende macht hebben. Overheid moet niet stimuleren of afremmen, omdat ze er best langzaam mee zijn vaak. Overheid moet denken vanuit perspectief van wat gaat het veranderen. Als het meer voordelen heeft moet je het misschien stimuleren. Denk niet dat de overheid het moet pushen, focussen op hoe gaat de wereld zijn, en daarna kijken naar of ze het wel of niet moeten pushen. Denk dat het sowieso wel gaat gebeuren. Als je zo'n auto hebt ga je heel veel vragen hebben over kleine dingetjes, misschien kan overheid daarin een rol spelen van elke moet dit dit en dat hebben. (framework) | IC26 |
| I think they have to cooperate with companies, because also the infrastructure has to be there, so they should work on that. | IC27 |
| Actively pushing is not what the government should do. | IC27 |
| If they regulate too strictly it will be annoying to customers. I don't see a reason for the government to hold it back, so maybe the will or should promote it more. | IC28 |
| Yeah definitely they should subsidize. They are one of the most important stakeholders in this. They decide everything. Now there are many accidents happening because of the people not being careful and breaking regulations, but with | IC29 |

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| automated driving system many of these errors can be avoided. So according to this they should subsidize to prevent accidents. | |
| Regulators do have very powerful role. Manufacturers could influence regulators to support them. Government also has power to enforce things. | IC30 |
| They should be friendly to proposals. So there is the question what to do with the lights when the cars don't need them. Companies could also propose a solution to the government and they could use it, because the manufacturers know this needs to happen for it to become a success. | IC31 |
| The government should ensure the safety of the citizens, meaning it shouldn't be allowed for sale unless the problems have been solved. It depends on the countries and the roads, like in the Balkan, where I'm from, no it cannot be on the roads. They would convince me with compatibility with other drivers who are not using the system. Or if it was faster or if it was as entertaining as normal driving. I would certainly want to be able to take control of the car whenever I want to. I would never go into a car that I don't have control of. | IC32 |
| Ja dat is wel een hele belangrijke denk ik, dat moet heel goed gereguleerd worden, zowel juridisch denk ik, van wie is er schuldig als er iets gebeurd, zelfrijdend vs niet zelfrijdend botsen bijv. Je zag dat er heel veel mensen elektrische auto's gingen kopen omdat het beter was, maar het was niet zoveel beter dan dat er korting was bijvoorbeeld. | IC33 |
| Ja dat is wel belangrijk natuurlijk. Er moeten toch subsidies komen voordat mensen dat gaan doen. In het begin moeten en regulaties zijn zodat er getest kan worden. Hoe eerder ze dat doen hoe eerder de technologie er kan zijn. Subsidie geven dan investeren ze eigenlijk gewoon in dat soort vervoersmiddelen, dus ik denk dat ze wel grote rol spelen. | IC34 |
| Kunnen ze op zich wel subsidies geven voor mensen die het gebruiken. Ook wegen aanpassen. | |
| Plan van Shell met aparte stroken voor zelfrijdende auto's, maar dan moeten wegen ook aangepast. | |
| Subsidies in het begin, later niet meer natuurlijk. Lost fileprobleem op blablabla. | IC35 |

| Role of Manufacturers (RoM0) | 0/28/0 |
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| I guess it could be like a niche first, before reaching the mass market | IC3 |
| Organize some demonstrations, organize some events. Also involve universities, since they provide knowledge. | IC4 |
| Gewoon langzaam brengen, niet te overhaast, gewoon stapje voor stapje acceptatie verhogen | IC5 |
| Make a concept car and get feedback from public. They should consider various audiences | IC7 |
| Car manufacturers would play an important role, mostly in the marketing department. Now everything is in internet and social media and everything. They should use this to show the technology working. | IC8 |
| Companies should invest in it, and eliminate people's fears. I think it is just a matter of fear of change | IC9 |
| I think taxi companies would buy and lease them, which means that they should also play a role in marketing. You don't have to market the safety, it should be assumed safe. | IC10 |
| Car manufacturers should work on issues that create acceptance. Trying to speed it up wouldn't be a good marketing strategy. As soon as possible isn't in anyone's interest, but as good as possible is. | IC11 |
| Autofabrikanten met goed veilig model komen om overheid te overtuigen dat het zou passen. | IC12 |
| Als je goed kunt vertellen dat grootste ergernissen verholpen worden, parkeren, files, 's nachts rijden, dan zal de acceptatie sneller gaan | IC13 |
| The more the car manufacturers show how safe and useful it is, the better it will be for the acceptance. | IC14 |
| Ik denk sowieso veiligheid benadrukken (door fabrikanten), want ik denk dat dat het grootste issue is van iedereen. Nu al een balletje opgooien, zodat je ziet dat ze er al lang mee bezig zijn. Zodat als het misschien pas over 15 jaar komt dat je dan het dan niet uit het niets komt. | IC15 |
| (Car companies) should show advantages, shift the focus from normal car to self-driving. The best thing would be pressuring safety. They should make normal cars look bad, they consume a lot, they are unsafe, and at the same time push for new. Comparing advantages and showing disadvantages of regular cars. | IC16 |
| If I know that other problems are also addressed already I would be more likely to buy, because I already know the benefits. | IC17 |
| I think it should be a teamwork. | IC18 |
| Car companies first have to show it's safe. Show that technology can make better decisions than humans. Show it to the customers well. Show the appeal of the novelty, wanting to be part of the future. | IC20 |

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| De voordelen moeten ze aanklaarten, dan sturen ze de mensen wel een bepaalde richting op en dat moet uiteindelijk dan ook wel lukken. Ik denk sowieso door de techniek toegankelijk te maken voor iedereen. En dat ze dan ook de voordelen laten inzien, dat ze dan uiteindelijk de mensen wel kunnen overtuigen. | IC21 |
| Denk dat het een kleine doelgroep is in het begin, die het wil en die het ook kan betalen. Eerst focussen op die kleine doelgroep. Je hoeft niet meteen iedereen aan te spreken, je moet ergens beginnen. Dat zijn waarschijnlijk de jongere hoger opgeleide technische mensen. Reclame maken daar kun je denk ik niet vroeg genoeg mee beginnen, want hoe vaker ze het zien hoe meer ze aan het idee gaan wennen. | IC22 |
| Weet ik niet, misschien proefrondjes en mensen het gevoel geven dat het kan en dat het werkt. Dat als je zo'n auto wil kopen dat je zo'n auto voor een week op proef kan hebben bijvoorbeeld en niet alleen een rondje om de kerk. Je moet de mensen wel kunnen overtuigen dat er een stukje veiligheid in zit, en comfort | IC23 |
| Also like really use these cars in famous demonstrations. Demonstrations are really nice because you really let people feel what it's like. They have to convince people about how the car behaves in traffic. Maybe make a movie about it, that would be nice. The point is to get the people who are more connected to the population to get started with this technology. If car manufacturers aim at well-known people or people who have certain position in society. | IC24 |
| If you don't let control go a 100% at the beginning, it would increase acceptance because at the beginning you don't know what to expect. So introduce it in steps | IC25 |
| Niet naar consumenten luisteren die weten toch niet wat ze willen. Autofabrikanten gaan er al vanuit dat het gaat komen. Ford gaat er al vanuit dat het er gaat zijn. Ford alleen bezig met hoe Ford ipv BMW en niet self-driving in general. | IC26 |
| If there's a lot of customers like me, they should keep the steering wheel, and just listen to the customers. | IC28 |
| I think that the most important thing they should do is to try to convince the people of the safety. I think that's why most people would doubt this, because they don't trust it. Maybe young people, but old people most definitely not. | IC29 |
| Manufacturers should push it as a plugin rather than a real car. Maybe they're only aiming at top of the pyramid. If you only focus top of pyramid as premium product you won't replace regular cars. You have to bring down prices or use add-ons or features. | IC30 |
| Companies could also propose a solution to the government and they could use it, because the manufacturers know this needs to happen for it to become a success. Sell it as a high-tech product, something that saves you time. And that usually when you take the train for example you're not driving it but it doesn't take you to far places. Yes high mobility and with comfort. | IC31 |
| Dus ik denk dat je een soort hybride iets krijgt, en waar het meeste geld te verdienen is commercieel gezien dat het daar het eerst heen gaat. Zoals transportbedrijven, taxibedrijven etc. Die zorgen ervoor dat er heel veel onderzoek naar gedaan wordt en dat het goedkoop wordt, en daarna wordt het dan mainstream. | IC33 |
| Gewoon laten zien dat het betrouwbaar is. Als er een paar op de weg verschijnen en er gebeurt nooit iets dan denk ik dat dat heel veel zou helpen. Ik denk dat betrouwbaarheid gewoon heel belangrijk is. | IC34 |
| Fabrikanten veel met bedrijven gaan samenwerken zodat die er eerst op overgaan. Afspraken maken met grote bedrijven dat ze veel afnemen, dan rijden er ook meteen veel rond dus dan gaan anderen misschien ook sneller over. | IC35 |

| General View on Technology (GVOT0) | 15/17/3 |
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| It's cooler as well than regular cars, not regarding safety | IC1 |
| I am both excited and skeptical about it. | IC2 |
| It is something I cannot really relate to yet | IC3 |
| I like technology, but in this case it is something that transcends my emotions of driving the car | IC4 |
| Lekker makkelijk, als het werkt is het goed, maar ja je raakt toch een beetje controle kwijt | IC5 |
| Voor zover ik weet werkt het gewoon prima | IC6 |
| A self-driving car would be like a luxury. | IC7 |
| Honestly right now, I don't think everything is ready. Maybe the technology is ready, but not the environment. | IC8 |
| I would definitely buy it, if it became a secure technology, I would not see why not | IC9 |
| I have a super positive view of it. You cannot do anything about it, these developments are coming and you cannot stop it. | IC10 |
| I am a technology passionate, so I am absolutely pro | IC11 |

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| Weet niet goed wat ik er zelf van vind. Zou het wel heel vet vinden als ze in het verkeer komen en in de infrastructuur. | IC12 |
| Ik hoop dat het nog heel lang duurt omdat ik heel erg hou van zelf rijden. | IC13 |
| Technologically it's really cool, I saw a video in which is prevented an accident and I didn't think it was that far already. | IC14 |
| Ik vind het wel tof, maar misschien ook ergens wel een beetje onnodig ofzo. | IC15 |
| What is my reaction? It's cool. Of course I am technology enthusiast so I think it's cool, it sounds futuristic. | IC16 |
| Being a person who doesn't like drive, and I find it very stressing, especially in my city or in Colombia, the road quality is the best, there are a lot of bad drivers, I think it would be very interesting in using a car where I don't have to worry about these problems. | IC17 |
| I think it's nice and it can be really useful, especially for long trips. I think it's a good change, but it will require a lot of change from us. | IC18 |
| Ja vaak wordt zo'n bericht een beetje negatief gebracht, maar ik kijk daar altijd wel een beetje doorheen. Ik sta er zelf wel positief tegen denk ik, tegen de komst van zelfrijdende auto's | IC19 |
| It could work, from a business perspective. I think that it will work. Companies will push this. Technology enthusiasts who want to have this car. | IC20 |
| Ja wat vind ik ervan, is een beetje tweeledig denk ik. | IC21 |
| Het klinkt nogal heel futuristisch, ik zou het nog niet zomaar zien gebeuren. Die stap klinkt best onwerkelijk. Ik heb wel een filmpje gezien dat de auto al afremt voordat de bestuurder het ziet, dus op zich is het wel goed natuurlijk. | IC22 |
| Aan de ene kant is het wel mooi dat het kan met de technologie, maar ik denk wel dat het in sommige situaties niet verstandig is, omdat de computer niet altijd ter vervanging van menselijke reactie kan werken. | IC23 |
| I've heard about the percentage of incidents that these cars were having, and that they were not due to technical problems, but due to other people hitting the cars themselves. Actually, I have a really positive view. I think they can do way better than us. | IC24 |
| I have heard that some company tested it on the road and it killed their driver. I think it's an attractive technology for the coming years. For me it's a bit mixed feeling. | IC25 |
| Ik vind het concept heel tof. | IC26 |
| I didn't know it will come in the near future, because I'm not fully confident with the system. Maybe they can be helpful, but fully self-driving is quite unfamiliar with me. | IC27 |
| Obviously it's quite cool, but I am a bit nervous as well, because I believe in myself more than a machine. | IC28 |
| I think it's cool for normal people, but people who enjoy driving, I don't think they will like it, because they will feel like they are not in control and that's why they drive. | IC29 |
| I would use it more for assistance rather than leaving everything to the car. | IC30 |
| I would feel happy to adapt, but I would be critical if you hear the first accidents happening, then I would be more critical. | IC31 |
| I have negative attitude about it, because I really love driving, and I would never make it computerized, the process of driving, even if there is traffic. | IC32 |
| Ik vraag me altijd of in hoeverre een auto beter kan zijn dan mens in autorijden. Ik denk dat op den duur er minder ongelukken door kunnen komen | IC33 |
| Ik heb het idee dat het meestal gewoon goed gaat. Ik sta er positiever tegenover dan de media het schetst. | IC34 |
| Positieve vooruitgang. Snelheidsboetes zullen minder worden, omzet openbaar vervoer. Minder banen vanwege taxichauffeurs die overbodig worden. Fileprobleem zal worden opgelost, minder kans op ongelukken. | IC35 |

| Willingness to Adopt (GVOT2) | 3/16/5 |
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| I'm not a early adopter or anyone leading, I'm more of a person who follows | IC1 |
| I will buy that, for sure. Maybe I will not be the first, but I could be among the first people willing to test it. | IC2 |
| I think my conservative mind could stop me. That I'm used to a traditional car, but I would consider it | IC3 |
| I would be quite suspicious of buying it | IC4 |
| Zou het zeker overwegen | IC5 |
| Ik denk dat het gewoon handig is als iedereen een zelfrijdende auto heeft zodat het ook met elkaar kan communiceren. | IC6 |

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| I would rather use other forms of transportation | IC7 |
| Als het proven technology is zou ik er zeker één kopen | IC12 |
| Ik zou het niet doen. | IC13 |
| Maybe when I just drive it and I like it. Being pessimistic of the technology could stop me, wondering if it could do what I could do. | IC14 |
| Yes, if it will possible to still have the possibility to drive. | IC16 |
| I would definitely buy it if I could afford it for example, depending on my income level. Let's say today I wouldn't invest in one because I know that well there are not so many self-driving cars, but in a future situation you have already I don't know 50-70% penetration I would be more likely to buy one. | IC17 |
| Ik zou hem sowieso overwegen dat wel, maar dan zou ik hem net zo overwegen als iedere andere auto. Hij komt gewoon in het rijtje samen met alle andere auto's, want dit is gewoon een extra perk ten opzichte van alle andere auto's. | IC19 |
| Ik denk wel dat we die kant uiteindelijk opgaan, maar toch zal daar wel zeker weerstand voor zijn. | IC21 |
| Dat zou het voor mij niet waard zijn omdat ik toch niet genoeg rij. De jongere generatie zal op een gegeven moment wel bereid zijn zo'n zelfrijdende auto te kopen. Ik denk dat de oudere generatie daar niet zo snel in mee zal gaan. | IC22 |
| Weet ik niet, als alles blijkt dat het werkt en getest is dan zou ik misschien wel overwegen om een zelfrijdende auto te kopen. | IC23 |
| Okay yeah I would definitely buy a car like this, but let's consider the price first. | IC24 |
| Yeah why not, I think I will buy it. | IC25 |
| Als het een soort van taxi is van huis naar werk met eventueel mensen in en uit, dan geen reden om te kopen want dan wordt het een soort uber. Wat echt tof zou zijn is dat ik hem zelf dan misschien niet hoeft te kopen dus ook geen self maintenance hoeft te doen. | IC26 |
| If everything is ready, yeah I would consider to buy such a car. | IC27 |
| Sure, sure, yeah. That's technology and there's no reason to accept it. If there's a problem then they should solve it, and that's not a reason not to accept it. If it's on the market I wouldn't be the first to buy it, because I am always the second or the third buyer because there's always trial and error in the beginning. | IC28 |
| I don't think I will completely use it the way it should be, but I would still consider buying it. | IC30 |
| I would surely not be in the ones who firstly choose the technology, because I am skeptical about it. I'm not against it as an idea, but I can foresee the problems that would arise. | IC32 |
| Als ik de keus had tussen volledig zelfrijdend of helemaal niet, dan volledig zelfrijdend (hybride geen optie). | IC33 |

Name of code (Abbreviation)

Number of times mentioned positively/neutral/negatively
X/X/X

| Interesting quote: | Candidate number |
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| If in a mixed situation the self-driving cars chooses to protect me better, I would choose it | IC1 |
| I can imagine that the design of the car would be completely different | IC2 |
| It's not about the actual safety but more about the perceived safety. When you go to the airport, the road to the airport is more risky than the actual flight on the plane. | IC2 |
| I also see the role of the universities and researchers in this, more than manufacturers. The role of the research here is to really find out the comparison compared to regular cars. Driver Behavior, number of accidents happened, do we really use time differently. Market factors. | IC3 |
| Het moet goed getest zijn door iets soortgelijks als nu bijvoorbeeld de crashtests. Of bijvoorbeeld invoeren soort van carpoolanes voor zelfrijdende auto's. | IC5 |
| The environmental impact of the technology is important for me | IC7 |
| People for us will buy cars in the future. Also the way in which cars are sold and the mentality behind purchasing cars. Companies will buy cars and we will rent them | IC10 |
| There should be a framework developed by governmental organizations to which algorithms can be tested. | IC10 |
| If the government keeps defensive position, it's way more difficult to trust automaker. | IC11 |

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| Maar niet exact op de wegen die er nu liggen 1-4 persoons auto's. Ik denk dat er eerder per dorp 30 grotere auto's staan. | IC12 |
| Wat me wel zou weerhouden is dat technologie steeds verandert. | IC12 |
| Er moet een industry standard komen van de software en dat moeten ze dan allemaal gaan implementeren, maar dat gaat denk ik niet gebeuren. Dus dan gaat de consument bepalen welke het meest gebruikersvriendelijk is. | IC13 |
| Everything will be connected because of Internet of Things (IOT) | IC14 |
| I think I would actually pay extra for it, but it also depends on how its updated in terms of software etc. | IC14 |
| Systemen, hoe goed ze ook in elkaar zitten, is er ook een angst dat ze gehackt kunnen worden. | IC15 |
| Ik vind het wel zorgwekkend dat over een paar generaties, de kinderen van onze kinderen, niet weten hoe je een auto moet besturen. Dan weet je niet meer hoe het verkeer werkt en dat dat misschien weg gaat vallen. | IC15 |
| Nu al een balletje opgooien, zodat je ziet dat ze er al lang mee bezig zijn. Zodat als het misschien pas over 15 jaar komt dat je dan het dan niet uit het niets komt. | IC15 |
| They should make normal cars look bad, they consume a lot, they are unsafe, and at the same time push for new. Comparing advantages and showing disadvantages of regular cars. | IC16 |
| I think other trends will also appear. Like carpooling where people will just step in a car when they come by. | IC17 |
| Let's say today I wouldn't invest in one because I know that well there are not so many self-driving cars, but in a future situation you have already I don't know 50-70% penetration I would be more likely to buy one. | IC17 |
| Also I will make sure maintenance is not an issue. | IC18 |
| I think it should be a teamwork. | IC18 |
| Wat ik zelfs denk, is dat in een verre toekomst, mag je niet meer zelf rijden. Als zo'n ontwikkeling er eenmaal door is, en er worden dan veel minder ongelukken gemaakt met zelfrijdende auto's en dan ga ik er even van uit dat het mogelijk is, dan mag je niet eens meer zelf rijden. | IC19 |
| Instead of owning a car, renting a car as a service in the future. | IC20 |
| Als ik denk aan een autonome auto, ja dan hoeft die niet eens van jezelf te zijn, dan hoeft je hem niet eens meer te kopen. | IC21 |
| Als alles zo is dan is het misschien wel goed, maar als de helft wel zo is en de helft niet dan werkt het ook niet. Dan moet je een speciale rijbaan voor zelfrijdende auto's. | IC22 |
| De jongere generatie zal op een gegeven moment wel bereid zijn zo'n zelfrijdende auto te kopen. Ik denk dat de oudere generatie daar niet zo snel in mee zal gaan. | IC22 |
| Reclame maken daar kun je denk ik niet vroeg genoeg mee beginnen, want hoe vaker ze het zien hoe meer ze aan het idee gaan wennen. | IC22 |
| I see it better with electric cars that drive while on the road. I see it in a really nice way with inductive charging in the road. I see it maybe in 30 years. Not all of them, just a few. I hope in 30 years so I will still enjoy it. | IC24 |
| The point is to get the people who are more connected to the population to get started with this technology. If car manufacturers aim at well-known people or people who have certain position in society. | IC24 |
| Wat ik denk dat het de kant opgaat dat je allemaal zelfrijdende auto's krijgt die je gaat gebruiken zoals je nu de trein gebruikt (commuting) | IC26 |
| Niet naar consumenten luisteren die weten toch niet wat ze willen. Autofabrikanten gaan er al vanuit dat het gaat komen. Ford gaat er al vanuit dat het er gaat zijn. Ford alleen bezig met hoe Ford ipv BMW en niet self-driving in general. | IC26 |
| I think it's going to be more like that, like for example a taxi with no more driver that you call and it picks you up. | IC28 |
| If you could plug it in on existing cars, people would be more willing. | IC30 |
| People here (NL) are more willing to accept change. | IC30 |
| The 50/50 experience I think I would like it more, so I can take a nap and be able to continue when I want. | IC31 |
| So I think first it could be truck platooning, then autonomous shipping then for people on the road. | IC31 |
| Then you do not need private cars, you could have I don't know self-driving buses, then it becomes public transportation actually. If I have a self-driving car I don't know why I would use it instead of the bus for example. | IC32 |
| Op zich zou het wel mooi zijn als verzekeraars bijvoorbeeld korting geven omdat het veiliger is, of dat je minder wegenbelasting betaalt omdat je minder wegen beschadigd bijvoorbeeld. Maar dat moet dan wel goed bewezen worden. Dat je normaal bijvoorbeeld 10 keer zo vaak remt en dat dat allemaal brandstof kost, en dat dat dan wetenschappelijk te bewijzen is en dat dat verschil dan vergoed wordt. Meer om het eerlijker te maken | IC33 |

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|---|------|
| Maar wat ik wel een heel goed concept aan hun vind en dat hoeft niet duur te zijn, is dat je altijd updates blijft houden, dus dat als er iets gebeurd of het blijkt toch niet goed te werken dat die software updates ervoor zorgen dat het wel goed blijft werken. Als er bijvoorbeeld een veiligheidslek lekken is dat ze dat zo ff fixen. | IC33 |
| Het kan ook op een kleine schaal zijn, dat bijvoorbeeld lijnbussen als eerste aan de beurt zijn. | IC34 |
| Afspraken maken met grote bedrijven dat ze veel afnemen, dan rijden er ook meteen veel rond dus dan gaan anderen misschien ook sneller over. | IC35 |

| | Factors playing a role in acceptance | #1 | #2 | #3 | #4 | #5 | TOTAL | WEIGHTED TOTAL |
|---|--|----|----|----|----|----|-------|----------------|
| A | Safety | 18 | 4 | 3 | 3 | 2 | 30 | 123 |
| G | Decreased traffic congestion | 2 | 2 | 3 | 5 | 3 | 15 | 40 |
| D | Ability to spend time on other activities | 2 | 4 | 5 | 2 | 1 | 14 | 46 |
| J | Comfort with the technology | 2 | 5 | 2 | 4 | 1 | 14 | 45 |
| E | Enhanced mobility for elderly, young, or impaired (drunk people, etc.) | 0 | 4 | 4 | 1 | 4 | 13 | 34 |
| M | Type of traveling (roadtripping or commuting to work) | 1 | 1 | 2 | 3 | 4 | 11 | 25 |
| O | Economic costs | 1 | 2 | 4 | 3 | 1 | 11 | 32 |
| R | Amount of self-driving cars already on the road | 2 | 3 | 1 | 2 | 3 | 11 | 32 |
| K | Ease of using the technology (navigating, configuration, etc.) | 1 | 0 | 2 | 5 | 2 | 10 | 23 |
| N | Ethical issues | 3 | 2 | 1 | 1 | 1 | 8 | 29 |
| F | Ability for car sharing | 1 | 2 | 1 | 2 | 1 | 7 | 21 |
| I | Higher speed limits | 0 | 1 | 2 | 1 | 3 | 7 | 15 |
| L | Pleasure of driving | 0 | 2 | 1 | 1 | 2 | 6 | 15 |
| P | Loss of jobs (taxi/truck drivers) | 0 | 0 | 1 | 0 | 2 | 3 | 5 |
| C | Social influence through word of mouth | 0 | 1 | 0 | 0 | 1 | 2 | 5 |
| Q | Loss of privacy | 0 | 0 | 1 | 0 | 1 | 2 | 4 |
| H | Hunting for parking eliminated | 0 | 0 | 0 | 0 | 1 | 1 | 1 |
| B | Social influence by media | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| | | | | | | | 165 | |

| Predictions how far technology is still away in years: | |
|--|--|
| IC4 | think the technology will not be fully accepted within the coming 10 or even 20 years. After that there so many political, societal, technological advancements, that it is difficult to say. |
| IC5 | Tot op zekere hoogte. Ik zie het nog niet snel gebeuren dat je op de achterbank ligt en niks hoeft te doen. Komende 20 jaar nog niet. |
| IC6 | Ik denk niet dat het 5 jaar gaat duren maar dat is meer omdat er mensen met geen verstand ervan in hoge positie zitten. In een tijdstip van 10-15 jaar moet wel redelijk te doen zijn om ze op de weg te krijgen |
| IC8 | Yeah I do think they will be the future probably, but maybe in 20-30 years, when everything has sensors so they can talk to eachother. |
| IC10 | It will require still some years. Maybe 7 years, 10 at maximum. |

| | |
|------|---|
| IC11 | Some industries actually live from accidents happening, so they might push against it. So maybe 20-30 years. |
| IC13 | Ik denk volledig zelfrijdend alles 100-150 jaar |
| IC14 | It will take another 3-4 years depending on the amount of testing that go into it. |
| IC16 | It is happening. But I expect that in 5 years it will be normal talking about it. Not only universities etc, but also newspapers. In the next 20 years an option to drive yourself will be needed, because people want to drive. After those 20 years, the main streets will be reserved to self-driving cars or something like that. |
| IC17 | According to some studies I also checked, it's not really going to happen in the coming 10 years, like fully autonomous cars. |
| IC18 | It will take more than 20 years, for sure. |
| IC19 | Ik denk dat het nog wel 40 jaar duurt. |
| IC21 | Het is moeilijk om een inschatting te maken, maar ik zie niet dat we binnen 5 jaar allemaal autonoom rijden, echt niet. |
| IC22 | Ja waarschijnlijk wel, want de technologie gaat zo hard en het is allemaal mogelijk, maar ik durf niet te zeggen of dat al binnen 10 jaar gebeurt, ik denk dat dat wel langer duurt. Als je ziet hoe snel de technologie ontwikkelt zou je zeggen dat dit ook wel snel komt, maar er gaan wel wat jaren overheen. |
| IC23 | Ik denk dat dat nog wel ff gaat duren, tegen de tijd dat iedereen daar op ingespeeld is zijn we wel weer tientallen jaren verder. |
| IC24 | I see it maybe in 30 years. Not all of them, just a few. I hope in 30 years so I will still enjoy it. |
| IC25 | If you have a timeline, I don't think in 5-10 years you can replace it with self-driving cars, but in more than 10 years it could be a possibility. But it's also how we want to accept it. |
| IC26 | Afhankelijk van hoe erg ze het pushen en welke ingang ze nemen, 10-15 jaar ofzo. Mass adoption misschien 20-25 jaar. |
| IC27 | Technology could be ready sooner, but changing roads takes longer, so maybe 20-30 years. |
| IC28 | Maybe in 5 years it could be there. Because I heard of self-parking 2-3 years ago and now it's there. So maybe in 5 years self-driving car is quite common. |
| IC30 | Well it also depends on how many years down the lane. In ten years I don't think so, technology wise maybe yes it's ready, but attitude and perception wise it will take a lot time. Especially in developing countries it won't happen within 10 years. |
| IC31 | Indeed yes I do. Maybe for the next 20 years there could be cars that can drive themselves, but there are always problems with regulations. So it will take 30-50 years because of regulations and trust of the people. |
| IC32 | I would say it would need a respective infrastructure for that to happen. I don't see it happening in the next 5 years but it could be the future. |
| IC33 | Ik dacht dat het heel lang zou duren, 5-10 jaar ofzo, maar nu zie je gewoon Tesla's al de baan houden op zichzelf. Dus ik zou er niet verbaasd van zijn als ze als er nu al een proef komt rond Amsterdam ofzo. |
| IC34 | Ik denk 20 jaar. |
| IC35 | 30 jaar ofzo. Het duurt ook wel even voordat iedereen overstapt op zo'n auto. Misschien nog wel sneller maar ja geen idee. |

D Interview Riender Happee (Expert 1)

Beste meneer Happee,

Op basis van ons gesprek afgelopen week heb ik een samenvatting gemaakt waarin ik de kern van dit gesprek probeer samen te vatten. Deze samenvatting voeg ik vervolgens toe aan de appendix van mijn verslag als empirisch materiaal, indien u het hiermee eens bent uiteraard. Hieronder volgt de samenvatting:

U gaf aan onderzoek te hebben gedaan naar de interactie met de mensen en ook naar acceptatie. U geeft aan dat er inderdaad een redelijke groep 'followers' is, die niet direct een zelfrijdende auto zou willen kopen, maar tegelijkertijd denkt u dat dit niet per se een probleem hoeft te vormen omdat in eerste instantie slechts een minderheid nodig is. Wat betreft de zorgen die mensen hebben rond de veiligheid tijdens de zogenaamde 'transitieperiode' zegt u dat eerst ook nog moet worden bewezen dat dit daadwerkelijk veiliger is. U merkte op dat er meer zorgen werden genoemd dan benefits, en dat dit overeenkomt met vindingen van anderen. Ook gaf u aan dat u ook denkt dat mensen die houden van het huidige autorijden sneller een auto met stuur zouden kopen. U stelt dat de autofabrikanten al wel reeds proberen voordelen zichtbaar te maken, zoals de luxe om iets anders te kunnen doen. Tegelijkertijd zegt u wel dat het adresseren van de zorgen ook heel belangrijk is.

Waar de overheid al heel duidelijk mee bezig is (TU Delft samen met Dutch Automotive Vehicle Initiative) is testen op de publieke weg. Dit heeft twee functies, ten eerste om van het lab naar de weg te gaan en van de expert driver naar de gewone gebruiker te gaan, en ten tweede om het te laten zien aan de mensen. De overheid is hierbij niet in directe zin betrokken bij het promoten van de technologie, maar doet dit dus wel indirect door het faciliteren van tests en organiseren van evenementen.

Ook stelt u dat Nederland zich positioneert als testland door partijen van over de wereld uit te nodigen om te testen. Deze tests zijn nog niet gestandaardiseerd, een voorbeeld hiervan zijn de WEpods. De eerste stap is dus vrij testen, waarin partijen aangemoedigd worden om op de openbare weg te testen. Hierbij hoeven eisen nog niet heel streng te zijn, omdat dit kleinschalig is en op ieder moment gestopt kan worden. Vervolgens is het dan steeds meer de bedoeling om de tests te verbeteren en standaardiseren, maar dat dit tijd vergt.

U stelt ook dat de ethische dilemma's die mensen schetsen vaak uitgaan van een kennisniveau van de zelfrijdende auto wat er nog niet is. Hierdoor is het moeilijk om die keuzes al te maken. Wel stelt u dat er naar uw mening redelijke consensus lijkt te zijn over het feit dat de inzittenden van de auto niet hoeven te worden opgeofferd om het leven van anderen te redden, maar dat het de vraag is of dit vastgelegd moet worden.

Wat betreft ongelukken tussen zelfrijdende en niet zelfrijdende auto's stelt u dat hier redelijke duidelijkheid over is, wat blijkt uit het statement gemaakt door Volvo. In dit statement claimt Volvo dat voor volledige zelfrijdende auto's (SAE level 3, 4 of 5), wanneer de persoon de ogen 'off the road' heeft

en dit ook toegestaan is, de fabrikant volledige verantwoordelijkheid neemt. De fabrikant gaat dit vervolgens verzekeren, wat volgens u bijna een volledige oplossing is.

Als laatste stelt u dat de auto industrie altijd evolutionair geweest is, en dat het lastig blijkt ineens iets heel anders neer te zetten. Hierdoor is het waarschijnlijk dat de nieuwe functionaliteiten van zelfrijdende functies stapsgewijs gaan worden geïntroduceerd in de huidige voertuigen.

Met vriendelijke groet,
Jens Kaan

E Interview Taede Tillema (Expert 2)

Beste meneer Tillema,

Op basis van ons gesprek heb ik een samenvatting gemaakt waarin ik de kern van dit gesprek probeer samen te vatten. Deze samenvatting voeg ik vervolgens toe aan de appendix van mijn verslag als empirisch materiaal, indien u het hiermee eens bent uiteraard. Hieronder volgt de samenvatting:

U gaf aan dat vanuit de overheid de beleidsdoelen doorstroming, verkeersveiligheid en milieu, maar dat ook economische aspecten en sociale inclusie nog een rol kunnen spelen als het gaat om zelfrijdende auto's. De vraag is wat er nu gedaan moet worden. Zorgt experimenteren ervoor dat de technologische doorontwikkeling mogelijk wordt, dan moet hier mogelijk in worden gestimuleerd, maar er moet ook gekeken worden naar het feit dat dit experimenteren op het moment misschien minder veilig is.

Ook stelt u dat er een grote focus is in de beleidsvorming op de voordelen en dat er mogelijk een soort optimisme heerst, terwijl dit op de korte termijn mogelijk allemaal nog best tegen gaat vallen en er dus ook rekening moet worden gehouden met een situatie waarin de technologie in eerste instantie minder veilig is. De vraag is dan of dit op de koop toegenomen moet worden omdat het op den duur veiliger wordt, of niet.

De stappen die momenteel genomen worden vanuit de rijksoverheid is wetgeving aanpassen. In het verdrag van Wenen staat dat de bestuurder ten alle tijden zijn handen aan het stuur moet houden, maar er wordt momenteel gewerkt aan een experimentele wet waarmee dit anders zou worden omdat dit voor testen/experimenteren de voorkeur heeft. Verder worden er pilots en testen gefaciliteerd. De RDW gaat hierin over toelating van de auto's op de weg. Het derde is internationale afstemming, in de declaration of Amsterdam werden vorig jaar principe afspraken gemaakt om de auto's allemaal met elkaar te laten communiceren, en dat zowel overheden als bedrijven er allemaal voor zorgen dat dit in dezelfde taal gebeurt.

De vraag bij veel experimenten is of er daadwerkelijk genoeg uit geleerd wordt en of dit goed met elkaar wordt gedeeld, en hoe het opgeschaald kan worden.

De cruciale stap is wanneer het van leuke gadget naar echte functionaliteit gaat, want dan gaan de voordelen pas echt een rol spelen. Ook moet dan nog gekeken worden naar beveiliging tegen hacks, omdat anders nog steeds de voordelen mogelijk achterwege blijven.

Ook leidt marketing rond bijvoorbeeld de WEpods ertoe dat er veel enthousiasme komt rond zelfrijdende auto's, wat misschien nog wel iets te voorbarig is, aangezien de technologie nog niet zo ver is op het moment.

Met vriendelijke groet,
Jens Kaan

F Interview Bert van Wee (Expert 3)

Beste meneer Van Wee,

Ik was denk ik nog vergeten te melden dat mijn bedoeling was om op basis van ons gesprek een korte samenvatting te maken waarin ik de kern van dit gesprek probeer samen te vatten. Deze samenvatting voeg ik vervolgens toe aan de appendix van mijn verslag als empirisch materiaal, indien u het hiermee eens bent uiteraard. Hieronder volgt de samenvatting:

U benoemde het feit dat acceptatie als consumer of als burger kan verschillen. Over het algemeen vond u dat veel resultaten niet erg verrassend waren, maar dat het ook vreemd zou zijn wanneer dit niet het geval zou zijn. U stelde dat de vindingen in dit onderzoek in lijn liggen met eerder gevonden resultaten.

Ook stelde u dat er nog veel onzekerheden zijn waardoor er nog geen duidelijke blauwdrukken te maken zijn. De overheid denkt er in ieder geval wel over na. Het feit minister Schulz heeft gezegd dat Nederland leidend moet zijn heeft het wel op de kaart gezet, maar dat op dit moment nog niet veel concreet kan worden gedaan.

Als het om voertuigtechnologie is er vooral het besef dat de EU aan zet is, dat niet elk land zijn eigen spelregels en wettelijke verplichtingen heeft.

Ook zijn er in de regel pas reclamecampagnes rondom een technologie zodra mensen deze ook daadwerkelijk kunnen kopen. Om de bewustwording op het moment al te vergroten wordt er vooral gebruik gemaakt van andere kanalen, zoals lobbyen binnen de EU, interviews geven aan media en demonstraties.

Er zijn theorieën over risicoacceptatie die suggereren dat mensen veel lagere risico's accepteren wanneer ze zelf niet in control zijn, wat betekent dat het misschien nog altijd niet goed genoeg is wanneer een zelfrijdende auto een keer zo veilig is. Hetzelfde geldt voor het feit dat meerdere kleine stappen vaak beter dan werken dan één grote.

Met vriendelijke groet,

Jens Kaan

G Interview Filippo Santoni De Sio (Expert 4)

Dear Mr. Santoni de Sio,

As I said I would send you a (reasonably) short summary including the most important points discussed during our conversation, which I will put in the appendix of my report if you agree with it. I would also like it if you could reference the papers you mentioned to me.

You said that ethical issues are broader than just the liability issues, but that the introduction self-driving cars at all can already be seen as an ethical issue. The literature is mostly separated in legal literature and ethical/philosophical literature.

Some people suggest to leave the issue of liability open, and allow people to program the ethics into their car themselves, although you do not think this is a good idea. You do agree though that it needs to be figured out before these cars are introduced. Your personal opinion is that fully autonomous cars will not happen soon yet, also for technical reason, and that many people who say they will are often 'biased' people. You claim to not be an expert on this however, so you cannot say this with certainty.

You also think that we should not only look at the big philosophical schools, and go back to the big principles of those schools. Instead, we should also look at many historical issues humanity has faced and the compromises that have been made there. A big help in many of these instances has been the law. There have been already trolley problems, and decision have already been taken. So rather than going back to the principles, take a look at these cases as well.

Since we still don't know all the details of a future scenario with self-driving cars however, some details will still remain abstract. In English/American law, which you looked at, issues are often solved case-based. So it is a lot about analogy, and current cases can serve as future reference.

You agree with lawyers, who often think that these dilemmas are not the most important problem, and that regulations and licensing are bigger issue.

You think it might happen that after a lot of speculations, a judge makes a different decision after the first accident, which might then set a precedent for future accidents. But it is almost impossible that fully autonomous vehicles will be released without some sort of directive.

There has been a proposal to test these vehicles (and robotics in general) in special zones, which creates a sort of midway between the lab and the real world. Japan has done this already before. This allows for not only technical testing, but also societal and legal testing, and gives you all the details to see how this could work out in the real world.

There probably is no 'right' decision, but a choice will have to be made what the best decision would be here. Your concern is also that there is a lot of interest at stake, and that people are biased. Therefore

we cannot just assumed car manufacturers to be unbiased in the proposals they put forward, as they also push their agenda. Citizens and scholars should therefore not consider the allegations by car manufacturers in the same way as the ones from an unbiased scientist.

Kind regards,

Jens Kaan

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