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BSc Thesis

Legitimacy for Shared Autonomous Electric Vehicles in the Netherlands

Author: *Roelof Stam*

Student number: *5532655*

Supervisors: *Laura van Oers, MSc.*

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Summary (English)

Shared Autonomous Electric Vehicles (SAEVs) have the potential to solve numerous problems we face in modern day transportation. Examples are, pollution, car accidents, time waste and congestions. The Netherlands is considered a leading country regarding autonomous vehicle readiness, which makes it interesting to explore what is still in the way of making SAEVs a significant part of future mobility in this country. Research shows that the Netherlands lack social acceptance, which is crucial for diffusion of a new technology. In order to establish social acceptance a technology has to accumulate legitimacy.

Therefore, the aim of this thesis is to find out what challenges and strategies are for automotive companies to establish legitimacy for SAEVs in the Netherlands. In the context of SAEVs this thesis examines different categories of legitimacy, challenges and strategies. In order to find meaningful answers to the research question a qualitative research was conducted and a purposive sampling method was used, focusing on all automotive companies operating in the Netherlands involved in SAEVs. In total 30 automotive companies were contacted and eventually four were interviewed. This was complemented by conducting two interviews with field experts. In total six qualitative interviews were conducted. I learned that societies uncertainty concerning the safety of autonomous vehicles is a big challenge for automotive companies to overcome. Furthermore, to some customers SAEVs mean loss of control and freedom. In addition, misalignment of SAEV technology and contemporary rules and legislation is a significant challenge for creating legitimacy. Not to mention, the general lack of social acceptance due to radicalness and newness of the innovation. Automotive companies implement numerous strategies to overcome these challenges and gain legitimacy. Primary strategies are; demonstrating safety through technical success, offering flexibility and familiarizing customers through a step-by-step process.

Keywords: Legitimacy, Shared autonomous electric vehicles (SAEVs), challenges, strategies, self-driving car

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1. Introduction

For the past half century motor vehicles have been one of the most popular forms of transportation and driving has always been entirely a human function (Fagant & Kockelman, 2015). Despite the fact that traffic fatalities rank as the 9th leading cause of death globally, motor vehicles are still the primary form of transportation in the western world (Asirt, 2018). Our modern day cars are probably one of the most polluting, time consuming and unsafe machines ever invented (Cameron, 1991 ; Katvez, 2003 ; Morgan Stanley, 2016).

Emerging technologies such as automated electric vehicles, peer-to-peer sharing applications and the interconnection through the internet of computing devices embedded in vehicles, have the potential to revolutionize and completely change mobility (Loeb & Kockelman, 2018). There is significant evidence that a future with almost zero crashes, zero congestion, and zero emission mobility is possible, when combining these technological breakthroughs in the form of 'Shared Autonomous Electric Vehicles' (SAEV's) (Collie, Rose, Choraria & Wegscheider 2017 ; Fagnant & Kockelman, 2014 ; Hars, 2015). SAEV's are driverless electric cars summoned on demand through an application on a smartphone. It will make traveling significantly safer, more efficient and less time consuming (Katvez, 2003). The spread of this form of transportation will potentially be beneficial for society as a whole. However, multiple challenges currently withhold widespread adoption of this innovation (Campbell, Egerstedt, How & Murray, 2010).

Recent research placed the Netherlands 1st in an autonomous vehicle readiness index (KPMG, 2018). According to this report, the Dutch ecosystem for autonomous vehicles (AVs) is ready for implementation. The roads in the Netherlands are of high quality and well maintained, and the internet connection throughout the country is very strong. Furthermore, the Dutch roads are already open to largescale testing with autonomous vehicles (KPMG, 2018). However, the roads are not yet filled with SAEVs. The fact that the Netherlands is taking the lead concerning stimulating the adoption of this technology (Ministry of Infrastructure and the Environment, 2017), makes it interesting to investigate what is still in the way of making SAEV's a significant part of future mobility in this country. Consumer surveys show that Dutch citizens are less accepting of AV technology than citizens of most other countries (BCG, 2015). This seems to be true especially in comparison with less developed countries, indicating that the willingness to accept AV technology could be related to the relative contentment with the current state of transportation (KPMG, 2018). The relatively low social acceptance may also have to do with the perception of safety, the idea that people want control over their driving or the concerns about job loss in transportation industries (Sivak & Schoettle, 2015).

Social acceptance is a crucial part of 'legitimacy', which is a critical factor that decides whether a technology fails or flourishes (Suchman, 1995). This depends on how well the technology fits in the socially constructed system of norms, values, beliefs and definitions (Suchman, 1995). A technology that is socially accepted, consistent with ingrained practices, well understood and ideally even endorsed by government and regulation, has a high degree of legitimacy, which is essential for successful adoption and development (Geels & Verhees 2011 ; Markard, Wirth & Truffer, 2016). New innovations are always vulnerable to the liabilities of newness, which makes it especially for a novel technology important to accumulate legitimacy (Aldrich & Fiol, 1994). This thesis focuses on automotive companies involved in SAEV technology. These companies are of significant importance since they bear a big part of the responsibility in creating legitimacy for the technology and products they produce and provide. The aim of this thesis is to answer the following research question:

What are challenges and corresponding strategies for automotive companies to gain legitimacy for SAEVs in the Netherlands?

Extensive literature review and qualitative data collection was done in order to find the relevant information needed to answer this research question. The theoretical relevance of this thesis is twofold. While research concerning legitimacy of companies and organizations has been done relatively often, literature focusing on legitimacy at the level of an industry or technological field is relatively scarce (Aldrich & Fiol, 1994 ; Bergek, Jacobsson & Sanden, 2008 ; Rao, 2002). Furthermore, to the best of my knowledge the theory of legitimacy has not yet been used to describe the diffusion of SAEVs and since accumulating legitimacy is of significant importance to new technologies, investigating the role of legitimacy concerning SAEV technology is rather interesting and scientifically relevant. In addition, The Netherlands is considered a leading country regarding societal readiness for SAEVs, which makes it a compelling case study, since it can be used as an example for other nations. Considering this new innovation has the potential to seriously improve social wellbeing, it is relevant to look into the creation of legitimacy to set a context that enables this technology to prosper and thrive.

In order to answer the abovementioned research question, the thesis proceeds as follows: section 2 gives a concise explanation of the concept of SAEVs and a brief review of relevant literature on legitimacy, in order to set the context and framework. Section 3 describes the qualitative method and data sources used. Section 4 will present the results. Section 5 will consist of a conclusion and section 6 contains the discussion.

2. Theoretical framework

This section consists of a brief explanation of SAEV technology, followed by a review of applicable literature on legitimacy, which will serve as a theoretical framework to study the phenomenon.

2.1. SAEVs

Shared Autonomous Electric Vehicles (SAEVs), are essentially a shared fleet of electric driverless cars that are capable of sensing the environment and navigating the roads without human input (Narla, 2013). Currently, most automotive companies involved in SAEV technology focus on so called 'eyes on' technology, meaning that the vehicle is capable of semi-autonomous driving, but it still requires a 'driver' to be in control at all times. The next step is 'eyes off' technology, which is the fully autonomous car. This vehicle is able to navigate completely without human intervention to a predetermined destination over roads that have not been adapted for its use. It acts as a virtual chauffeur, passengers are never expected to drive the vehicle themselves. This Autonomous Electric Vehicle (AEV) is essentially a car without a steering wheel. When AEVs are a reality they could be linked to car sharing initiatives, which results in the SAEV. In order for this disruptive innovation to be diffused into society numerous barriers have to be overcome. Expected challenges for gaining legitimacy for SAEVs are: people's perception of safety, loss of freedom, loss of privacy, concern about the loss of jobs in the transportation sector and resistance to change in general. The following paragraph discusses the concept of legitimacy through applicable literature, setting a relevant context and framework, in order to further study these challenges.

2.2. Legitimacy

Suchman describes legitimacy as *"a generalized perception or assumption that the actions of an entity are desirable, proper, or appropriate within some socially constructed system of norms, values, beliefs, and definitions"* (Suchman, 1995, p 574). Legitimacy has been used extensively in organizational context, in order to explain that organizations comply to their contextual environment so that they are, for example, able to mobilize the resources they need to achieve their business objectives (Bergek et al., 2008 ; Markard et al., 2015). The concept of legitimacy is often used in relation to 'newness', in the form of new ventures and industries but can also be studied in relation to new technologies (Markard et al., 2015). If a technology does not fit in the constructed system, is disapproved by the masses and is not ratified by government or institutions, the development and widespread acceptance of this technology may be hampered (Bergek et al., 2008 ; Breukers & Wolsink 2007 ; Markard et al., 2015). This thesis aims to contribute to the relatively scarce amount of existing literature on legitimacy on a technological level, by

looking into the legitimation process of SAEV technology in the Netherlands. Legitimacy is important for the diffusion of a new technology, since for it to exist and develop, society needs to approve to some extent and regulatory support needs to be established. The next paragraphs will illustrate different types of legitimacy that can be accumulated.

2.2.1. Legitimacy types

Using a wide range of existing literature, Suchman (1995) distinguishes three different categories of legitimacy: pragmatic, moral and cognitive legitimacy. These categories are all grounded in the perception that organizational activities and/or technological consequences are appropriate and deemed desirable within a specific system of norms, values and beliefs (Suchman, 1995). However, they differ to some extent in their motives and causes. Pragmatic legitimacy mainly focuses on particular groups of constituencies, while moral and cognitive legitimacy can provide us with a better understanding of how to achieve widespread acceptance and adoption for a novel technology (Suchman, 1995). Therefore, in examining what challenges automotive companies need to address to create legitimacy for SAEVs in the Netherlands, this thesis hones in on moral and cognitive legitimacy.

Moral legitimacy

Moral legitimacy refers to the degree that the actions or consequences of an organization or technology are perceived positively and are aligned with the values and beliefs of the social context in which it is operating. Suchman (1995) subdivided moral legitimacy into two types: moral *normative* and moral *regulative* legitimacy. Moral *normative* legitimacy is achieved when society views the activity as “the right thing to do” (Suchman, 1995, P 579). This judgment is often based on the promotion of social welfare, which in turn is defined by the socially constructed value system. Moral *regulative* legitimacy can be obtained by sticking to accepted procedures formalized by the regulatory agency. These procedures form structures that provide legislative context and stability to society (Rao, 2002 ; Suchman, 1995). A technology could achieve this when operating within the legislative context of predetermined rules and regulations.

Cognitive legitimacy

Cognitive legitimacy is a type of legitimacy in which the organization or technology is completely ingrained in society. The final stage is a taken-for-granted status, in which society not only accepts an organization or technology but deems it as necessary or inevitable and alternatives become unthinkable (Jepperson & Meyer, 1991 ; Suchman, 1995). This is considered the most subtle but most powerful source of legitimacy. Unfortunately, this type of legitimacy is extremely rare and only very few organizations or technologies ever reach this status (Suchman, 1995).

2.2.2. Legitimization strategies

Legitimacy is a subjective concept, it is a certain perception observers have about a company, industry or technology. Legitimacy is not a tangible object to be possessed but a reflection of the alignment with the social context (Scott, 1995). Since legitimacy is shaped by perception, it can also be influenced and changed (Van Oers, Boon & Moors, 2018). Therefore, actors can make a significant difference in the extent to which the existence of a certain technology is perceived as desirable, proper and appropriate within a certain social context (Suchman, 1995 ; Johnson, Dowd & Ridgeway, 2006). The creation of legitimacy is very much dependent on the way actors communicate and advocate for or against a certain technology. In the following paragraph challenges and strategies of gaining legitimacy are examined.

Gaining legitimacy

The first challenge for gaining legitimacy is ‘winning acceptance’ for the specific technology. The second challenge is to create new loyal constituents and to convince already existing, validated entities to provide support. Finding constituents and supporting entities is perceived to be most difficult when technologies are radical, uncertain or risky (Ashforth & Gibbs, 1990), like SAEVs. The most direct and practical way of establish **moral normative legitimacy**, is through accumulating a record of technical success (Ashforth & Gibbs, 1990). Technical performance does not only create consequential legitimacy, with interest-grabbing demonstrations of technical success, it can establish lasting validation for the technology. However, technical success becomes most persuasive when demonstrated by many different organizations (Suchman, 1995). This could be obtained by SAEV technology when it demonstrates to be safer than vehicles with human drivers and adds positive value to society. To establish **moral regulative legitimacy**, a technology can conform to rules and regulations, or try to manipulate them through lobbying efforts. SAEVs need to be in line with rules concerning liability, data protection, privacy and more. When the focus shifts from moral to **cognitive legitimacy** the need for combined technical demonstration

becomes even more important (Suchman, 1995). A technology introduced and backed by only one actor can reach comprehensibility and taken-for-grantedness, but only through severe persistence. However, the potential of real collective action in creating legitimacy is far greater. In creating cognitive legitimacy, such collective action takes the shape of either popularization (comprehensibility) or standardization (taken-for-grantedness) (Scott, 1991 ; Zucker, 1990). A prominent strategy for popularization is continued storytelling, which demonstrates the realness and presence of the technology (Pfeffer, 1981). This can be done through the use of media, lobbying, advertisement and scientific research (Greenwood & Hinings, 1988). In order to reach standardization of a technology, it is likely that simply the predominance and long-term presence of this certain technology gives it legitimacy (Suchman, 1995). One could argue that if SAEVs become popular (comprehensible) and manage to stay popular, they eventually will be able to reach taken-for-granted status.

The different types and illustrated strategies to gain legitimacy will function as theoretical framework, from which I will identify challenges and strategies for gaining legitimacy for SAEVs in the Netherlands. The following section will illustrate the research method used in order to find relevant data to answer the research question stated in the introduction.

3. Methodology

This thesis aims to examine challenges and according strategies for automotive companies to gain legitimacy for SAEVs in the Netherlands. SAEVs have the potential to solve numerous problems in modern day transportation and the Netherlands is a leading country concerning autonomous vehicle readiness, which makes it a relevant case study. The outline of this section is as follows: first the research design is discussed, followed by an explanation of the operationalization and data collection method used, after which data analysis procedures are illustrated.

3.1. Research design

In order to find meaningful answers to the research question, that focuses on understanding the phenomenon rather than testing a certain hypothesis, this thesis uses a qualitative research method. Trying to 'understand' a certain phenomenon is inclined towards qualitative research methods, which often results in descriptive data (Taylor & Bogdan, 2015). To gather relevant data in-depth interviews

were conducted. This research has predominantly used inductive reasoning, through an exploratory research approach, with the legitimacy theory of Suchman (1995) in mind.

3.2. Operationalization and data collection

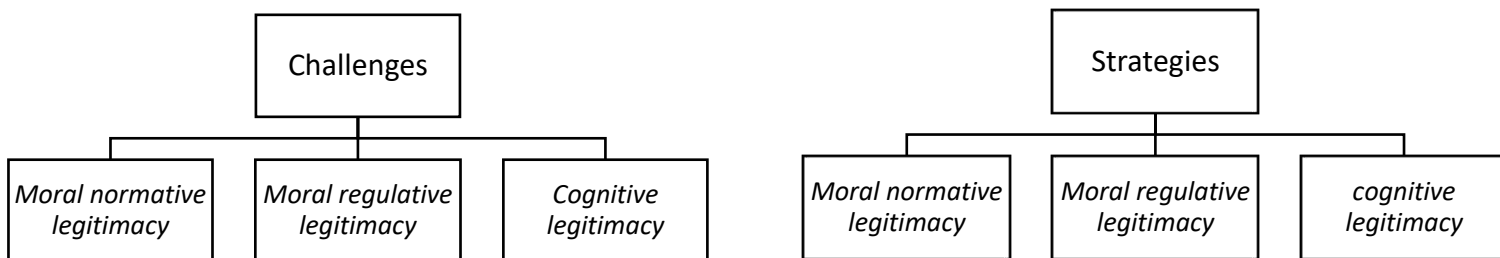
In trying to understand the legitimation process of SAEVs in the Netherlands this thesis distinguishes between two main research goals. First, I intend to get a better understanding of challenges automotive companies face in the legitimation process of SAEV technology. Second, I aim to explore corresponding strategies to overcome these challenges in order to gain legitimacy. To find the right respondents in order to gather necessary data, a purposive sampling method was used, focusing on all automotive companies involved in SAEV technology and that operate in the Netherlands. All companies represented by the respondents currently focus on autonomous features and technologies that are considered 'building blocks' for the fully autonomous vehicle. These autonomous features are a precursor for AEV and SAEV technology. Therefore, legitimacy created for these autonomous vehicle building blocks can be directly linked to legitimacy for AEV and SAEV technology.

Actors that were approached for interviews are communication directors that work in the automotive industry. I focused on communication directors since they are responsible for the external perception of the company and its products, which has a direct impact on social acceptance of their brand. Therefore, I assume them to have a broad understanding of the legitimation process for SAEVs. In total, 30 automotive companies were approached. Six qualitative interviews were conducted: four with automotive companies and two with field experts. To collect all necessary data, the in-depth interviews were open and semi-structured, in order to combine a pre-determined set of open questions, with room for discussion to explore particular themes or responses. Legitimacy theory was used as a framework from which the interview questions were assembled and made. On average every interview took 45 minutes. All interviews were recorded and transcribed afterwards. Since the collective view of all respondents permits the identification of patterns and similarities concerning the legitimation process, no statements in relation to specific respondents were made. Therefore, all quotations and references in the result section were presented anonymously. All respondents were assigned an R1-R6 randomly.

3.3. Data analysis

After conducting and transcribing all interviews, the collected data was ordered, reduced and analyzed to be compared and eventually reveal insights concerning the research questions. 'Nvivo' coding software was used to order and reduce all collected data. Codes were pre-assembled on the basis of the research question and legitimacy framework. Two parent codes were developed: 'challenges' and 'strategies' for creating legitimacy for SAEVs. These were then subdivided into three child codes, one for each type of legitimacy: moral normative, moral regulative and cognitive legitimacy. This is illustrated in Figure 1.

Figure 1: pre-assembled codes



Although encoding is always a form of interpretation and therefore different results may arise when repeating the research, during the coding process I stayed as close to the data as possible to ensure, to the best of my ability, an objective data analysis. After all interviews were coded, all codes were divided into the six different pre-assembled codes. Once quotations on the same topics are bundled together, one can fairly easily look for conflicts, patterns and similarities. These steps are crucial to generate generic results and avoid theoretical bias. Once the created groups of codes were analyzed, concepts and patterns emerged, from which relevant information on the legitimation process was obtained. After data analysis, reliability of the main findings was discussed with one of the two field experts, chosen based on his or her experience and understanding of SAEVs in the Netherlands. The following section illustrates the results, which were found after thoroughly analyzing the collected data.

4. Results

This section provides insights concerning the legitimation process of SAEV technology in the Netherlands, with the aim to illustrate the challenges and corresponding strategies for creating legitimacy for SAEVs that automotive companies in the Netherlands encounter. The outline of this section is as follows: first the challenges for creating legitimacy for SAEVs are illustrated, after which strategies implemented by automotive companies in an attempt to create legitimacy are discussed.

4.1. Challenges creating legitimacy for SAEVs

The challenges for creating legitimacy are subdivided into 3 groups, moral normative, moral regulative and cognitive legitimacy. Section 4.1.1-4.1.3, provide insights in challenges that withhold companies of gaining legitimacy for SAEVs.

4.1.1. Challenges in acquiring moral normative legitimacy

A technology can gain moral normative legitimacy, when its audience views the activity or outcome of the technology as “the right thing to do”, which is often based on social welfare (Suchman, 1995, P 579). All respondents argue that *safety* is a key concept while establishing moral legitimacy for SAEVs. Customers wonder if this technology is safe enough, and recent accidents involving autopilot, which is a precursor of completely autonomous vehicles, raise many questions. As one respondent argues:

“The autopilot, something you already see at Tesla, which is of course contemporary marketing for future self-driving technology, has been involved in some accidents lately, that doesn’t hinder technological development, however it does interfere with social acceptance.” (R1)

Despite the recent accidents in the United States, respondents argue that self-driving features already prove to enhance safety and efficiency, in comparison to the average human driver. However, many people have enormous confidence in their own driving abilities and often believe they can drive better than a self-driving car ever could. Respondents argue that among certain groups a *false believe in human superiority* prevails, which is a challenge for achieving moral legitimacy. Besides, some clients of the automotive companies involved in SAEV technology are simply not willing to pay for safety. They do not see the need of driving-assistants since they are perfectly able to drive their vehicle themselves (R2 ; R4).

Furthermore, autonomous driving and car sharing is often seen as a solution to the problem of buying, maintaining and driving a motor vehicle. However, these are problems to some and a hobby to others

(R2). According to respondents, there is definitely a considerable group of car enthusiasts which do not see the need for change. Although this trend is decreasing it is definitely not negligible. These same people believe that the joy of driving will disappear with the arrival of autonomous vehicle technology, which is why they resist this new innovation. They raise the following question: why do we want technology to take over this part of our lives? To them SAEVs mean *loss of control and freedom*, which are challenges to establishing moral legitimacy.

To conclude, the main challenges in acquiring moral normative legitimacy according to respondents are customers' *perception of safety*, the *false believe in human superiority*, and the idea of *loss of control and freedom*.

4.1.2. Challenges in acquiring moral regulative legitimacy

A new technology can gain moral regulative legitimacy by following accepted and already formalized procedures by regulatory agencies. However, all respondents agree that for a radical new technology as SAEV to be able to be aligned with laws and regulations, formalized procedures have to be drastically adjusted. For instance, legislation stipulates that the driver should be completely in control and have his hands on the wheel at all times, unless changing gear or indicating (R4). This is problematic for the diffusion of driverless vehicles. In the context of *liability*, many difficult unanswered questions prevail. Before AEVs enter the road and become a reality, the following questions will have to be answered:

“Who is responsible when an AEV crashes? Is that the passenger of the AEV, will it be the manufacturer of the car, should it be the road manager, or is it the party that crashes into you?” (R5)

In order to answer these questions, an agreement between manufacturers, insurance companies, mobility providers and the government will have to be established (R5). Furthermore, *Data protection* is of significant importance and privacy has to be guaranteed (R2). Only when regulations are adjusted, autonomous driving can become a reality.

To conclude, the biggest challenge in acquiring moral regulative legitimacy according to respondents is *misalignment with rules and regulations*. Ambiguity concerning liability, privacy and data protection will have to be solved, before SAEV technology can be diffused.

4.1.3. Challenges in acquiring cognitive legitimacy

In order for SAEVs to be fully ingrained into society, the technology should not only be accepted, but should be deemed necessary and alternatives have to become unthinkable. At this point, SAEV technology is not fully accepted by the majority of customers (R3). Respondents argue this is due to a *lack of knowledge* concerning the possibilities of autonomous systems and as a result of *fear for the unknown*. This is common when a new radical innovation enters the market. One of the respondents made the following comparison:

“At the beginning of the last century, when the car industry started to take off, in England automotive vehicles were required to be led by a pedestrian waving a red flag. They were so afraid of cars! That is the same fear you see nowadays for autonomous driving.” (R2)

In general respondents argued that clients often view autonomous technology as *unnecessary*. One respondent compared it to the diffusion of the airbag (R2). Nowadays nobody doubts the safety benefits of this invention, but when the airbag was first introduced, it was offered as a luxury option, one that was barely ordered by customers. People strongly believed in their driving capabilities and were not willing to pay for safety. Eventually the diffusion of the airbag completely changed the safety standards in society and every new vehicle today is equipped with this technology (R2). Respondents argue the same will have to happen to autonomous vehicle technology. Beliefs about safety standards held within the social context will have to change for AEV technology to be deemed necessary and gain legitimacy.

All respondents argued that AEVs will become reality sooner or later, however, we will continue to see forces in the market that resist this new technology. Respondents argued that the switch to the self-driving car is considered enormous progress and therefore leads to a lot of *resistance*. The overall resistance to change is due to the newness and radical nature of SAEV technology (R1 ; R2).

To conclude, the biggest challenges in acquiring cognitive legitimacy according to respondents are: *lack of knowledge* within society, *fear of the unknown*, SAEVs considered to be *unnecessary* and overall *resistance to change*. These challenges and more have to be overcome before alternatives to SAEVs become unthinkable and a taken-for-granted status can be reached.

4.2. Strategies for creating legitimacy

To overcome the aforementioned challenges for creating legitimacy numerous strategies are implemented by car manufacturers involved in SAEV technology. In general, respondents argue that, although completely autonomous vehicles operating in everyday traffic are still far away, the technological development of SAEVs is moving fast and the bottle neck is consumer acceptance. In sections 4.2.1-4.2.3, the main strategies for creating moral normative, moral regulative and cognitive legitimacy illustrated by the respondents are discussed.

4.2.1. Strategies for creating moral normative legitimacy

Moral normative legitimacy can be achieved through alignment with the values and beliefs of the social context and accumulating a record of technological success. In general respondents argued that *safety* is one of the core characteristics of SAEVs to accumulate moral legitimacy. In order to establish moral legitimacy, car manufacturers engage customers in the process and make people acquainted with the technology, while showing all safety benefits. Respondents agree that in order to gain customer acceptance, it is of utmost importance that technical mistakes are kept to a minimum. It is already evident that contemporary safety systems and autonomous features are making driving safer. One respondent nicely illustrates this:

“In recent years, for the first time we had more bicycle related victims than car casualties. Cars are becoming safer due to those autonomous features, which will eventually transform cars into autonomous vehicles. And there is no one in the industry who doubts that.” (R2)

Respondents claim that SAEV technology has the potential to change norms concerning safety. When it becomes evident that the number of casualties with autonomous vehicles is significantly less than with the vehicles with human drivers, the normal car could completely lose moral legitimacy. It may even become socially unacceptable to drive a normal car in the far future (R1). One respondent made the following comparison:

“Smoking used to be socially accepted, which is no longer the case. The majority of the people believe lighting up a cigarette in a restaurant is anti-social behavior. This is exactly what is going to happen to the normal car, in the future we will no longer want people to drive themselves.” (R1)

Respondents argue that due to the increasing importance of sustainability and new standards concerning car safety, companies building sports cars will have to reinvent themselves, to conform to the norms and

values of Dutch citizens or risk losing their legitimacy. Respondents argue that, with the arrival of autonomous vehicles, the importance of driving pleasure and design is decreasing and people are increasingly valuing convenience.

Furthermore, respondents argued the importance of *flexibility* to accumulate moral legitimacy. Since there is still a significant group of car enthusiasts, the choice to drive with or without assistance is deemed to be important in order to achieve widespread social acceptance. Flexibility is provided by simply offering the new autonomous features to existing clients as a built-in autopilot mode in their vehicle. People then have the chance to experience these features themselves to see if it enhances convenience (R4). The following example was illustrated by one of the respondents:

“the [car name] can drive autonomously, but you are not obligated to turn on the self-driving system. It is a choice not an obligation. People consider it to be fun and since it is already in their car, they like to try it out. This way new autonomous features spread like a wildfire.” (R2)

Finally, respondents argued that *involving customers* in the process and providing *detailed explanations* about autonomous driving accumulates moral legitimacy. Driving a car with autonomous features can feel unnatural the first couple of times. For example, ‘traffic jam pilot’ technology, one of those autonomous vehicle building blocks, is able to keep the right distance between the car in front of you, by stopping and accelerating exactly when is appropriate. Totally giving away control is something people need to get accustomed to (R4). The car companies engaged in AEV technology provide detailed explanations and driving lessons to clients, so they can experience autonomous features in a safe environment.

To conclude, in order to gain moral legitimacy the companies involved in SAEV technology try to prove that they add value to overall social wellbeing. The main strategies according to respondents are; *demonstrating safety*, providing *flexibility*, and *involving customers* in the process while providing *detailed explanations* about SAEV technology. Furthermore SAEV technology seems to have the potential to manipulate norms and values in society.

4.2.2. Strategies for creating moral regulative legitimacy

Next to moral normative legitimacy, a technology can acquire moral regulative legitimacy by sticking to accepted procedures formalized by regulatory agencies. However, as described by respondents illustrated in section 4.1.2, diffusion of SAEV technology requires a different set of rules. Therefore, formulated laws and regulations may have to be adjusted.

The involvement concerning reformation of legislation varies among respondents. Although the company represented by one respondent, works together with governmental institutions to test autonomous vehicles on the public road, most initiatives do not come from individual companies but rather as industry collective action. This is often in cooperation with the Ministry of Infrastructure and Environment, with the intend to allow broad scale testing of autonomous vehicles on public roads (R5). The following example of collective industry effort illustrates how moral regulative legitimacy can be obtained:

“Another collective initiative happened 2 years ago. That day a European summit took place in Amsterdam. This same day all companies involved in AEV technology in the Netherlands did a joint platooning exhibition, driving semi-autonomously along the A2 from Amsterdam to junction Beesd. In order to raise international governmental awareness for autonomous vehicles, with the intent to stimulate regulative development concerning the technology.” (R4)

In general respondents argue that to achieve alignment between legislation and the new technology, an agreement between manufacturers, insurance companies, mobility providers and the government, concerning new rules and regulations has to be established. There are already multiple groups of stakeholders that try to achieve this (R5). However, none of the car companies represented by the respondents, are taking part in these initiatives. Most automotive companies are not actively involved in aligning regulations with future technological developments in the Netherlands. Respondents argue that their lack of involvement is due to the fact that implementation of this technology is expected to happen first in the United States and some parts of Asia.¹

¹ Real efforts to create moral regulative legitimacy are concentrated in the United States and Asia. Due to the many different governmental bodies in the EU, the alignment and adjustment of regulations concerning liability and privacy will prove difficult in this part of the world.

Furthermore, respondents emphasize the possibility that cars with human drivers will lose moral regulative legitimacy due to dangerousness compared to a good functioning self-driving vehicle. It may even become illegal to drive a normal car in the far future (R1).

To conclude, most respondents are not very active in aligning rules and regulations with SAEV technology. However, the respondents argued that their main strategy to establish moral regulative legitimacy is to collectively *test the technology with governmental bodies*. This way technological possibilities are demonstrated and clarity regarding the required changes in legislation and regulations become evident.

4.2.3. Strategies for creating cognitive legitimacy

Cognitive legitimacy is gained when a technology is deemed comprehensible, necessary and alternatives have become unthinkable. This can be achieved simply by predominance and long-term presence of SAEV technology. However, to many people in the Netherlands fully autonomous vehicles still seem like science fiction (R3).

According to all respondents, familiarizing customers with this technology is a *'step-by-step' process*. The incorporated new technological features like 'emergency braking', 'lane keeping assistance', 'cross car communication', 'traffic jam pilot' and 'advanced cruise control', are all building blocks to achieve full autonomous driving in the future. Customers seem to be very satisfied with these autonomous features. The technology gradually advances and so far customer acceptance runs approximately parallel to it (R1).

As mentioned in the theoretical framework section 2.1, most companies interviewed currently focus on so called 'eyes on' technology. This means the car will be able to drive autonomously, however, you are still positioned behind the wheel, in order to intervene if necessary. This form of autonomous driving is already starting to take shape, cars like Tesla have advanced autopilot systems that can drive highways without human intervention (R4). 'Eyes off' technology is the next step, enabling the chauffeur to sit in the backseat of the car and read a book, which is still quite far off (R4). After eyes off technology is established it could be linked to car sharing initiatives, which results in the SAEV (R5). By gradually imbedding more autonomous features in the vehicles, customers have time to adapt, and are more inclined to accept the fully autonomous vehicle in the future. Through this step-by-step process the companies are able to show safety features, increased convenience and overall technological success. Although most respondents agree that fully autonomous vehicles are not that popular yet, this step-by-step process enables them to slowly popularize self-driving cars. They further enhance the presence of

this new technology through testing projects in the Netherlands, which they share with followers and supporters on the internet.

According to most respondents this step-by-step process is a *collective industry effort*, together they show the endless possibilities of autonomous driving. One respondent argued the following:

“Every self-respecting car manufacturing is involved in autonomous driving, in one way or another.” (R1)

Although autonomous vehicles are far from reaching a taken-for-granted status, according to the respondents, AEVs and SAEVs will eventually become standardized in our society. Respondents find it complicated to provide an accurate time estimation, since so many variables influence the speed of diffusion of this technology. However, they all agree that this technology will play a dominant role in future mobility. To conclude, respondents argue that accumulating cognitive legitimacy is a *step-by-step process* and a *collective industry effort*.

5. Conclusion

This research was done to clarify challenges and corresponding strategies for creating legitimacy for SAEVs that automotive companies operating in the Netherlands encounter. The following challenges to acquire moral normative legitimacy became apparent: Society questions the safety of self-driving cars. Many people are convinced they are excellent drivers and some are not willing to pay for extra safety features. Furthermore, not everyone wants technology to take over this specific part of their lives, to some people SAEVs mean loss of control and freedom. Corresponding strategies are: demonstrating safety, offering flexibility and providing detailed explanations about new autonomous features.

Perhaps the biggest moral regulative legitimacy issue is the fact that SAEV technology is not aligned with contemporary rules and legislation. To date, aside from testing of the technologies with government agencies and raising awareness to stimulate the development of regulations, no real strategies to gain moral regulative legitimacy are in motion.

In addition, challenges to accumulate cognitive legitimacy are: A lack of knowledge and fear of the unknown and the fact that many customers do not view this technology as necessary. Furthermore, a general lack of social acceptance due to the radicalness and newness of the innovation. In order to gain comprehensibility and popularity, companies strive to familiarize customers with SAEV technology through a collective industry step-by-step process. The technology gradually advances and is implemented in new vehicles and the customer acceptance runs approximately parallel to it. Through this process companies are able to show safety benefits, increased convenience and overall technological success. By gradually adding more self-driving features to the vehicles customers will be more inclined to accept the SAEVs of the future.

6. Discussion

In this last section results are interpreted in the light of the theoretical framework and the method used. Furthermore, the results and theoretical implications are positioned in the existing body of literature. Lastly, social impacts are addressed, and suggestions for further research will be illustrated.

In line with Suchman (1995), the results of this thesis illustrate the importance of technical success as a strategy for gaining legitimacy. Suchman (1995) emphasizes the importance of collective demonstrations of technical success in order to achieve cognitive legitimacy and a taken-for-granted status. In alignment with the theory, results show that demonstrating safety through technical success is a collective industry effort in order to accumulate social acceptance. Furthermore, Suchman (1995) argues that a company or industry is able to change existing norms, values and beliefs held within an social context. The results entail that SAEVs as a technology, probably also has this potential. In addition, Suchman (1995) claims that through demonstrations of technical accomplishments an organization or technology can establish lasting validation. Although the results do not contradict this, they emphasize the fragility of social acceptance for SAEVs. Car accidents due to errors caused by autonomous vehicle technology have the potential to greatly interfere with established social acceptance. Although Suchman (1995) emphasizes strategies for gaining, maintaining and repairing legitimacy, there is not much literature on losing the chance to gain legitimacy to begin with. This would be interesting for radical innovations since they are at risk of missing out on social acceptance even before it is accumulated.

The semi-structured, qualitative interview design allowed for comprehensive answers to interview questions, which enabled me to gather interesting in-depth industry knowledge. However, this is a single case study merely aiming to broaden our understanding of the legitimation process of SAEV technology. Due to the relatively small group of respondents and qualitative nature of this research, it is not possible to generalize challenges and strategies for legitimacy among all automotive companies involved in SAEVs the Netherlands. Results show that the automotive companies interviewed currently focus on eyes-on technology and follow a step-by-step process implementing autonomous features. However, some companies, like Google², focus completely on eyes-off technology. Although this is not reflected in the results, those companies will probably use a more radical legitimization approach.

² *although relevant companies were involved in this research, it was unfortunately not possible to interview Tesla or Google, which are considered market leaders concerning autonomous vehicle technology.*

Dowling & Pfeffer (1975) emphasize that legitimacy can be gained through the implementation of certain strategies. However, respondents argue that automotive companies are not always proactively creating legitimacy for technological innovations, they often focus on fulfilling the already existing needs of their customers. Fulfilling the needs or creating value based on the self-interest of a specific audience, is what Suchman (1995) categorizes as pragmatic legitimacy. I decided to focus on the other categories of legitimacy, since pragmatic legitimacy mainly focuses on particular groups of constituencies and this thesis aims to get a better understanding of how to achieve widespread acceptance for SAEVs in the Netherlands as a whole. To get a better understanding of legitimization for SAEV technology concerning particular customers, adding pragmatic legitimacy to the theoretical framework would be relevant.

Altogether, the theory of legitimacy appears to be useful to get a better scientific understanding of consumer acceptance of SAEV technology. Legitimacy as theoretical framework clarifies challenges and corresponding strategies automotive companies involved in SAEV encounter, while trying to accumulate social acceptance. This thesis adds to the relatively scarce amount of literature focusing on legitimacy at the level of a technological field. It contributes to our knowledge of the possibility that technologies to some extent can change norms values, rules and regulations held within society.

The diffusion of SAEVs has the potential to significantly change the car industry, it seems that gaining legitimacy for SAEVs is at least partly correlated with the loss of legitimacy for the normal car. Many respondents argued that the normal cars will eventually become cultural heritage and in a couple of centuries only some conserved models will be left. Furthermore, In the introduction societal relevance of the Netherlands as case study was discussed, arguing that this specific case was interesting since the Netherlands is a front runner concerning autonomous vehicle readiness and could be used as an example for other nations. This is relevant for other nations, however, being a leader concerning this technology can also be beneficial to the Netherlands itself. Technological innovations concerning smart infrastructure and SAEV technology, assuming that these come from a Dutch company, could contribute to the overall economy in the country.

Finally I propose several further research directions. Firstly, this thesis focuses on automotive companies which illustrates a one-sided perspective of the legitimation process. However, different audiences may view specific legitimacy issues differently. Legitimacy is created collectively, through a social process involving numerous actors such as, expert scholars, technology developers, governmental institutions and interest groups. These would all be interesting groups to consider for further research. Secondly, it would be interesting to look into challenges and strategies for maintaining legitimacy for the vehicle with human

driver, to see how this relates to gaining legitimacy of SAEVs. Furthermore, looking into the legitimization process of companies focusing on eyes-on technology only, instead of eyes-off, would be an interesting topic for further investigation. Lastly, I would suggest future research to look into the ability of radical innovations to change norms and values in society. Results entail that SAEVs have the potential to change norms concerning safety. It would be rather interesting to investigate if other technologies also have this potential.

7. References

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