LUND UNIVERSITY

Do you trust your car?

Enacting car safety

Jennifer Tong

Master of Applied Cultural Analysis
Department of Arts and Cultural Sciences
TKAM02 - Spring 2016

Supervisor:
Jessica Enevold

Abstract

Do you trust your car? Enacting car safety

Jennifer Tong

As the era of self-driving cars approaches, there is extensive discussion in the media about the next generation of vehicles: the potential safety benefits offered by new, increasingly automated, advanced driver assistance technologies, as well as the public's possible distrust and reluctance to use them. This thesis contributes to the discussion by offering a cultural analysis of car safety. The analysis delves into who and what are involved in making a safe car, from the driver's perspective, and is based on qualitative research carried out between September 2015 and January 2016 as part of an internship with Volvo Cars. Semi-structured interviews and observations conducted with drivers, both in-person and online, produced data that was then analyzed by employing the theoretical perspectives of actor-network theory and the conceptualization of trust as a reducer of social complexity. The analysis offers an understanding of car safety that involves two interrelated actor-networks—1) that of vehicle safety and 2) that of driving safety—that are populated by diverse human and non-human actors who enact car safety by performing trusting relationships. This finding offers automakers and public safety organizations knowledge to be used whenever introducing new and unfamiliar automated vehicle technologies. By taking into consideration that safe cars are enacted by vehicle- and driving safety actor-networks that necessarily involve trust, permits further considerations for how actor-networks might also be established to enact safe self-driving cars.

Keywords: car safety; vehicle safety; driving safety; drivers; advanced driver assistance systems; self-driving car, cultural analysis; actor-network theory; trust.

Acknowledgments

This thesis would not exist were it not for the contributions of a large and supportive network of people and things. Of the "human actors" in this network, I would, first and foremost, extend my gratitude to the gracious parents who agreed to participate in my research and who thoughtfully answered my question, shared their experiences, and let me into their cars.

I would also like to thank Annie Rydström and her colleagues at Volvo Cars for kindly welcoming me into the company offices and for your interest in and support of my research. Thanks also to Vaike Fors, Christopher Martin, and their fellow researchers at the Swedish Centre for Applied Cultural Analysis for letting me join in discussions about cars and automation; it was the perfect intellectual jump-start for my own research. Tom O'Dell, the person who set me on my own path of car research, thank you for your academic encouragement, for your engaging lectures, and for (alongside Mark Vacher) introducing me to social theory and forever changing the way I understand the world. Thank you also to Jessica Enevold, my thesis advisor, for always offering solid, practical advice and excellent editing suggestions, and for boosting my confidence when needed—my thesis is undoubtedly better for having you in its network.

To Isabel Rescala and Marie Lindbäck, thanks for always saving me a chair at the library and for sharing your thoughts on theory, methods and the pain of academic writing. Our friendship was a great support to me throughout this past semester.

Lastly, I give thanks to and for my two wonderful families on both sides of the world. You have kept me afloat for the past two years with your words of encouragement, your care packages, and your babysitting services. Especially to Roger and Ruby, thank you for taking care of me everyday, for providing warm hugs and warm meals when needed, and for not only letting me ramble on about cars and theory but for also listening.

Lund, 2016-08-22
Jennifer Tong

Table of contents

1. Introduction

> Lauren explained to me her motivations for acquiring her last vehicle. She spoke about her family situation three years ago—about the arrival of her baby, about going back to work, and about her husband's aging and ailing Jetta whose engine required an hour of idling at the curb before the car could be driven. She laughed describing this, seemingly in disbelief that they had put up with the inconvenience. Lauren described the car as being a risk should an emergency arise and her husband was at home alone with their child. They had accepted her parents' used, but still much newer and roomier, Mazda CX7. Then she had discovered this car had below average safety ratings for side impact and roll-over. "And for me safety is the biggest concern," she emphasized. This had prompted her to research new cars and ultimately led to the purchase of a new Subaru Forester with better gas mileage and great safety ratings according to the Insurance Institute of Highway Safety. When asked if she was pleased with the Forester's performance in terms of fuel efficiency and safety she replied, "Yeah. Well, I don't know ... safety. Hopefully we'll never have to test that part of it. But I feel better, you know, I feel more comfortable being in the car and knowing - knowing that. (Field notes and excerpts from Interview 6)

This conversation I had with Lauren was one of several interviews I conducted with drivers to learn what they "know" about their cars' safety. I wondered what kind of "comforting knowledge" did they obtain from safety ratings? And what other things factored into their "knowing" of car safety? The interviews were part of a research project I conducted during an internship with the Swedish automaker, Volvo Cars, in which I investigated how American drivers related to their cars, including looking at what car safety meant to the them. During my fieldwork I became intrigued with how drivers, like Lauren, discussed car safety —how they "know" or "feel" their cars are safe. When I asked the drivers for clarification of what was actually known or felt, their answers were to a great degree not about the vehicle itself. Most of them knew, in fact, very little about the internal workings of their car, and only one driver admitted to actually doing his own vehicle maintenance and repairs. So, what exactly did these drivers know?

1.1 Aim and research question

For my thesis, I focus solely on the issue of car safety with the aim of offering a socio-cultural understanding of car safety from the driver's perspective. The research questions I pursue are simply put: "What is a safe car?" and "How does a driver "know" this?" To answer this an applied cultural analysis was conducted, examining how drivers

spoke about car safety and how they practiced it in their driving. I wanted to learn how the drivers thought about their cars, and how they used them. What kind of information did they have about their cars, and from where did they source it? Did they themselves contribute to the safety of the car and in what manner? I found that answering "what is a safe car?" is not a matter of defining a certain type of object, it is rather about recognizing the people, things, experiences and relationships that enact a safe car.

1.2 Thesis structure

The remainder of this thesis presents my empirical research and my analysis. Chapter two begins with supplying the context for investigating car safety. I begin with a brief description of the car's presence in contemporary society, and follow this with a section presenting a selection of previous research on cars and what my thesis contributes to the body of car studies literature.

In chapter three the research design is discussed. It begins with how the research topic emerged from a student internship, and then some thoughts on the participant selection and the researcher's position are presented. I then offer a conceptualization of my research field and lay out the fieldwork methods I used.

In chapter four, I introduce the theoretical perspectives I used to contextualize the empirical material. These are actor-network theory and theoretical conceptualizations of trust as a mechanism through which social systems are stabilized. Chapters five and six follow and are devoted to analyzing the empirical material in conversation with the aforementioned theories.

Chapter six concludes the thesis by establishing the key findings of the research and analysis on car safety and I suggest possibilities for the application of this knowledge. Finally, I offer some thoughts on directions for expanding current knowledge on car safety.

2. The interesting thing about cars

At times cars are an unremarkable and largely forgettable feature of daily life, and yet at the other times they are partners in very personal relationships with their owners. Cars are a commodity in a billion dollar industry supported by a global infrastructure, but as well an object that captures the public's imagination as a symbol of freedom and identity. The car is an intriguing object of social and cultural meaning, and its presence in the world is growing.

Over the years, the number of passenger cars worldwide has increased steadily. In 2013, the number of passenger vehicles[1] reached an estimated 850 million, a number that is expected to grow to over 2 billion by 2050 (Fia Foundation, 2016; International Energy Agency [IEA], 2009). The World Health Organization (WHO, 2015) has reported that in the past three years alone the number of registered vehicles has increased by 16% culminating in a record 67 million new passenger cars being purchased in 2014. While the global trend of rising car ownership is flattening out in higher income nations (IEA, 2009), in the United States a record 17.5 million cars and trucks were reported sold in 2015 (Harwell & Mufson, 2016; Spector, Bennet & Stoll, 2016). The U.S. ranks highest globally in car ownership, with registered passenger vehicles[2] recorded at over 240 million in 2014; a figure that in fact surpasses the number of licensed drivers in the country (United States Department of Transportation, Bureau of Transportation Statistics, [BTS] 2015).

As the car population increases, its impact on the world increases as well, both for the better and for the worse. In the following section, I present a selection of previous social research on cars. The literature I chose represents different approaches to studying cars, and thus different interpretations of the car's social and cultural significance. I found these texts be a useful starting point, and ongoing inspiration, for my own research and analysis of cars and car safety.

2.1 Previous research

In early academic literature the car appeared primarily "as a case-study within the history of industrial production, design history and environmentalist critiques" (Miller, 2001, p. 6). However of recent the car has become a topic of increasing interest in cultural studies.

Anthropologist Daniel Miller (2001) discusses the car as an aspect of material culture, to be appreciated for its distinct presence in the world and for the way people express and live their humanity through their cars. This is reflected in various studies that reveal the car and the associated concept of automobility (meaning the way people move around in cars, and

what this affords) to be an embodiment and a communicator of issues of power (Davies, 1999), social class and identity (O'Dell, 2001), racism (Gilroy, 2001), gender (Clarke, 2007; Enevold, 2003), national identity (Edensor, 2005; Seiler, 2008), and the American ideals of freedom, self-determination, and individualism (Enevold, 2003; Eyerman & Löfgren, 1995). The car has also been studied as a mobile space that in contemporary usage serves additionally as a multi-tasking workplace (Laurier, 2005); as an extended family space in which multiple social roles and interactions are situated with respect to affordances of the car (Noy, 2009); and as a place that through controlled mediated sound can create privacy and "warmth" even as one passes through the "chill" of an urban environment (Bull, 2005). In addition, the affective dimensions of driving, how one feels through the car and feels in the car, have been studied (Katz,1999; Sheller, 2005).

When it comes to car safety there is considerably less literature emanating from social and cultural studies. There are historical analyses of the shaping of vehicle- and traffic safety in the United States (Lemov, 2015; Mashaw & Harfst, 1990), and cultural analyses of auto safety discourse in Germany (Saupe, 2010) and in the U.S. (Packer, 2008). Sociologist J. Peter Rothe (1994) offers an analysis of traffic safety which suggests seeing it as a social process, and that the tendency towards "blaming the driver" ignores the role cultural values play in shaping the perspectives and decisions involved in traffic situations and traffic safety policy-making. For his part, sociologist Jörg Beckmann's (2005) argues that traffic safety is linked in part to trust (the more trust driver has in seat belts, safety laws, the driver assistance technology and so on, the less risk of being involved in a traffic accident), and in part to the denial of driving risks in the way that evidence of traffic accidents are removed literally and figuratively from the road: "the illusion of safety is reconstructed by an accident investigation that aims at preventing the recurrence of the crash" (p.95).

In my own turn, I approach the topic of cars through a cultural analysis of car safety, investigating the way car safety is enacted through drivers' car-related practices. My research, founded on empirical data and using social theory as a frame to interpret the data, is intended to have relevance for broader discussions of vehicle-, driver-, and traffic safety.

3. Studying cars and safety: the research design

The aim of my research fieldwork was to produce data on and around the topic of car safety, specifically focusing on who and what were necessary, from the driver's perspective, in making a safe car. In this chapter the design and implementation of the fieldwork are presented. Section 3.1 begins, with a description of the research internship from which the research topic originated. Sections 3.2 and 3.3 follow with discussions about participant selection and researcher positionality as it pertains to this study. Then in sections 3.4 and 3.5 I discuss the field as I conceptualized it and review the fieldwork methods used.

3.1 Starting with Volvo: the background of the research project

My research began as a 10-week, internship with Volvo Cars based in Gothenburg, Sweden, which was conducted from August to October in 2015. Volvo and most of the major car manufacturers, and several non-automotive technology corporations as well, are in the process of developing "autonomous drive" technology for passenger cars. There are "semi-autonomous" cars on the roads today, ones that use advanced driver assistance technologies which include adaptive cruise control, lane keeping assist, pre-collision automatic braking, and more. Essentially, these vehicles can drive themselves under certain conditions but a human must be at the wheel to monitor and take over control if needed. The auto industry outlook is that fully autonomous, "self-driving", cars, will be available as soon as 2020 (Greenough, 2016; Muoio, 2016). For its part, Volvo has announced it will in 2017 test 100 of its self-driving cars with real drivers on the roads of Gothenburg, Sweden. The company states that its autonomous drive technologies will offer a "calmer, safer, cleaner" way to travel (Volvo Cars, n.d.-a); which is to say Volvo believes that its self-driving cars will drive better, safer and more efficiently, than humans.

There is indeed an anticipation that self-driving cars will provide safety benefits to society, in terms of reducing the incidence and severity of car collisions (Anderson, Kalra, Stanley, Sorensen, Samaras & Oluwatola, 2014; Bertoncello & Wee, 2015; National Highway Traffic Safety Administration [NHTSA], 2013). Globally, there were approximately 387,500 road traffic deaths linked to cars in 2013 (WHO, 2015). In the United States, there were over 32,000 deaths in 2014 attributed to motor vehicles (NHTSA, 2016); and 94% of these are estimated to be caused by human error (NHTSA, 2015). Hence, the hope is these statistics can be improved by introducing self-driving cars, thereby removing the human error

in driving. However, the future of self-driving cars is very much affected by whether the public will trust and accept them.

Thus, my internship contact person at Volvo, a digital user experience researcher, expressed an interest in understanding what barriers exist for drivers in accepting the autonomous drive technology. With this in mind, I developed an applied research project to investigate how drivers related to their cars, including examining what car safety meant to drivers and how or whether advanced driver assistance technologies factored into this. Because of Volvo's interest in expanding into the American market, I decided to focus on American drivers. Additionally, I decided to narrow the focus to researching "American parent" drivers based on my conjecture of that parents would display a relatively high awareness of car safety. Motor vehicle crashes are the leading cause of death for American children and teens (Center for Disease Control and Prevention, 2016). Likely because of this, there is a great amount of car safety information directed towards parents. My Google search of "parent car safety" produces millions of links to webpages created specifically to warn and advise parents on "safe driving with children", "safe car seats", "child restraint systems", "teen drivers and safety", "passenger safety for children" and more. The links include webpages created by non-profit organizations (e.g. the Governors Highway Safety Association, the National Safety Council, the Insurance Institute for Highway Safety, the American Academy of Pediatricians, the American Automobile Association), and by American governmental agencies (e.g. the National Highway Traffic Safety Administration, the Center for Disease Control and Prevention, and state-run motor vehicle departments and highway patrol agencies). Based on the amount of car safety information directed at parents, I made a prediction that parents, as opposed to non-parents, would potentially be more aware of safety issues and more conscious about their safety practices with regards to cars and driving (see also Sheller, 2005).

While my internship research had a broader aim, for my thesis I chose to focus solely on car safety from the perspective of "American parent drivers". Empirical material I used for my thesis research was obtained from fieldwork conducted remotely during the internship, which included online interviews and observations of work commutes captured in driver-made videos, and from additional fieldwork conducted in January 2016 in California which entailed on-site observations, some of which I also captured in video, and in-person interviews. (See Appendix B for a fieldwork log) More details of this fieldwork are presented below.

3.2 Parents and drivers: the study participants

My study participants were 13 American parent drivers, four couples and five individuals, living in or near San Francisco, California or Seattle, Washington. This included seven mothers and six fathers ranging between 37-54 years of age. The nine families represented in the research were all 2-parent households, and were at or above median income levels for the regions within which they resided. Six of these families consisted of two working parents. Eight of the families had one to two children living at home. (See Appendix A for a study participant list)

A "snowball" or chain referral method for recruiting study participants was employed, meaning that access to initial participants led to referrals for additional participants. While a chain referral method for recruiting is usually motivated by a need to access difficult to reach or concealed populations (Biernacki & Waldorf, 1981), it has proven also to be an "economical, efficient and effective" recruitment method for some studies that are in nature qualitative, exploratory and descriptive (Atkinson & Flint, 2001). As my research project was indeed a qualitative and exploratory one and also limited in regards to time and financing, I deemed a chain referral recruitment process to be warranted. My personal network of family and friends was used to recruit a first round of participants. Then using contacts from this group, a second round of participants was recruited.

For the initial recruitment, a short questionnaire was emailed to potential participants asking them to describe themselves, any family members residing with them and their likes and dislikes regarding their vehicles and driving routines. This was used to identify and select parents with some similar characteristics thus standardizing the participant sample somewhat. I sought to include persons who owned their own cars, had a substantial weekly driving routine, and were also within a certain range of income and education levels. For the second round of recruitment, additional criteria were added to balance the participant pool in terms of gender, age range and geographical range. While I succeeded in evening out the number of men and women, I was not able to recruit younger parent drivers in their 20s, nor any parent drivers from additional metropolitan areas.

Nevertheless, the participant sample that I assembled proved ultimately to be adequate for generating enough data to identify patterns and deviations in the way the parent drivers spoke about car safety and in the way they practiced it in daily driving routines.

3.3 Insider and friend: positioning myself as researcher

In this section I address the fact that I am myself an American, a parent, and have been a regular, exasperated car commuter in the San Francisco region for a substantial number of years. As such I am familiar with and feel an affinity for the research topic and the participants' experiences and attitudes. As an "American parent driver", I share an identity with my study participants and I am thus more or less positioned on the "inside" of my research field.

There are different conceptualizations of what an "insider researcher" is. A basic formulation of this would be a researcher conducting work "within a social group, organization or culture of which the researcher is also a member" (Greene, 2014). A general assumption is that insider researchers have intimate knowledge about their community that "offers [them] insights that are difficult or impossible to access by an outsider" (Labaree, 2002). However, the anthropologist, Delmos Jones (1970), argues that there is nothing inherently better about being positioned as either an insider- or outsider researcher. Both positions come with advantages and challenges. What is more interesting to consider is that "insiders and outsiders may be able to collect different data [and that] they also have different points of view which may lead to different interpretations of the same set of data" (Jones, 1970, p. 252).

In my research, I believe having an insider position did lead to certain outcomes. I based my insider position on a shared identity and, I want to add, friendship. As a result of participant recruitment beginning with inquiries among my personal network, I had prior, and in some cases close, relationships with ten of the participants. The researcher Robert Labaree (2002) points out that there are potential advantages, and dilemmas, that face insider researchers. One of the advantages he cites is access, to "special groups within the community and to critical information" (Labaree, 2002, p. 104). I found my position did give me ready access to potential participants. Being an insider and a friend allowed me quick entry into a community of parent drivers, and offered me prior knowledge of many of the individuals' lifestyles which made identifying and recruiting participants relatively quick and efficient. Additionally, with regards to access to information, my insider position helped to put the participants at ease during the interviews permitting a better flow of information. For my friends, the trust and rapport from our existing relationships allowed them to openly share with me their personal narratives with regards to their families and driving. Whereas with the participants with whom I was less familiar, I was able to leverage our shared identity—by

expressing empathy for their experiences and as well as offering my own—as a way to encourage these participants' to give their thoughts and accounts about car safety.

Regarding "dilemmas" the insider position created during my fieldwork, I found sometimes when conducting observations that I was *too* familiar with the field. Labaree (2002) discusses similar situations in which the intimacy and familiarity of the field that is inherent in the insider position "hides the opportunity for the mundane and the ordinary to inform the study" (p. 108). In particular during observations of the participants' work commutes, I found it difficult to remain observant during the familiar, numbing monotony of stop-and-go traffic. At these times it was a challenge to maintain a high level of alertness to the nuances of the driving practices. However, this was less a problem with the commutes captured in video recordings. These recordings allowed opportunities for "re-observing" as many times as needed, during which I would deliberately try "distancing" myself from my own familiarity with driving and commuting and attempt to see the phenomenon with fresh eyes.

Finally, reflecting on how my insider position impacted my interpretation of what I observed and heard in the field, I feel being an insider was helpful. Anthropologist Emiko Ohnuki-Tierney (1984) asserts that native anthropologists are in a better position to understand not only the intellectual but also the emotive and sensory dimensions of behavior. I found that in my research, it was indeed useful to have previously experienced being a sleep-deprived parent driving with a crying infant in the rear seat, an anxious mother driving late to daycare pick-up, and, as well, an irrationally outraged commuter stuck in gridlock. Given this, I was able to recognize the driving scenarios participants described and performed, and to detect the emotional subtexts in them. In this way, my insiderness offered a useful researcher perspective and a contextual horizon from which to analyze and interpret my empirical data.

3.4 Following safety: the field and fieldwork methods

I present in this final section some reflections on my fieldwork. Cultural analysis has its academic roots in cultural anthropology (Sunderland & Denny, 2007), or ethnology as it is alternatively referred to in Europe (Czarniawska, 2007). In line with this heritage, my fieldwork relied on ethnographic methods that stem from anthropology. I selected the specific methods, semi-structured interviews and non-participant observations, in consideration for would best serve the research topic. However, the way in which the field of research was constructed necessitated variations in the way the methods were carried out. Therefore, I first

offer some thoughts on how the research field was conceptualized. Following this, I discuss the fieldwork methods and their perceived usefulness in exploring the concept of car safety.

3.4.1 *The field*

A researcher constructs her field of study through a constant process of decision-making (Hirvi, 2012). This involves decisions of what, who and how to study and occurs throughout the various stages of the research (Hirvi, 2012). These decisions are sometimes strategic, sometimes pragmatic, often both.

In deciding to study and recruit American parents as drivers, I had made a strategic choice and hoped these individuals might perform and practice safety in a conscious or at least obvious way—more than non-parents. In some ways this was also a pragmatic decision, based on my belief that my insider identity would offer an advantage in recruiting and communicating with the study participants. Due to the time and financial limitations of the research project combined with my location in Sweden, my decision for the early stages of the research was to do the fieldwork remotely. This meant the majority of interviews were done online via video conferencing and the observations were made by using videos created by participants who were willing to record themselves while driving. This decision to do remote fieldwork was strategic in that I believed the methods would generate useful data, but it was mostly pragmatic given the project constraints. Later in the project, my personal situation allowed for a 2-week visit to the San Francisco Bay Area which permitted in-person observations, and additional in-person interviews. The decision for this was very much strategic in that I hoped to confirm or find variations from the patterns I had begun to detect in the data gathered remotely. In addition, I was curious to see what I could learn about the limitations of remote fieldwork.

In reflecting on these decisions and consequences, I find it useful to understand the field that I researched not as physical, geographical, site, but rather as a place and activity constituted on the one hand during my in-person visits with the participants for interviews and observations, and on the other during my online and digital interactions with participants and their practices from afar. The field was "made up of people and their practices, material objects and social sites" (Hirvi, 2012) of which I the researcher was very much a part. The study participants, their driving practices and relationships, their cars, my framing of the research, and the communication technologies that were available all converged to create a field that was uniquely configured and interconnected with the research methods and outcomes.

3.4.2 *Semi-structured interviews*

I anticipated that the phenomenon of car safety was likely be amorphous and imprecise in the individual's perception, thus semi-structured interviewing was chosen as a method for allowing the participants to speak freely and in their own terms about the topic. I understood that while a researcher controls the overall topic of the interview, there must be an awareness that the respondents may not be able to speak about the topic in the terms that the researcher suggests, and that responses may be open-ended statements and not necessarily restricted to preconceived notions (Davies, 2002). Thus, I was prepared with an interview guide from which to gently steer the interview discussion, but because I myself had no real pre-conceived notions of what form car safety would take, the participants were obliged to take the topic in directions that made sense for themselves.

I understood also that the time and place of the interview has consequences for the way in which interactions unfold and how participants respond (Davies, 2002). With respect to the video conferencing interviews, being online allowed considerable flexibility for the participants in choosing their interview setting. Most chose to do their interviews at home, and during the evening after their children were in bed or weekend mornings (although their choice in time was partly constrained by the time difference between Sweden and the United States' west coast).

In retrospect I feel that the online interviews worked well. In the case of the participants who were unfamiliar with me, there was a security and comfort of being in a familiar space as inferred by their body language. From the way Scott eased back into his office chair and chuckled often at his own anecdotes, and from the way that Beth put me on hold while she sang her daughter to sleep and then returned to our conversation with a bottle of beer in hand, I perceived the participants as being relaxed during our conversations. Another example of this is Marie, whom was a friend of a friend, someone I had not met before except through brief emails to set up the online interview.

> The Skype window on my laptop revealed Marie in her bedroom. The bedside lamp cast a yellow glow on everything. I was surprised to find her in her bathrobe, seated cross-legged on her bed. It was 8:30 pm her time. She told me her children were in bed and her husband was out. The interview seemed like a quirky distraction for her, she laughed and joked throughout our Skype session. (Fieldnotes)

This participant seemed quite at ease, as did Scott and Beth. It is possible that for them, the computer monitor created a comfortable social distance in which the interaction felt less confrontational than the formality or intensity of a face-to-face meeting.

The online interviews also had an unexpected benefit for my interactions with friends and familiars. Because there was no prior routine of videoconferencing between the participants and myself, and there was a relative formality in the way I had set up the interviews, this allowed the participants to recognize the setting and discussion as being "formally bracketed, and set off in time and space as something different from usual social interaction" (Davies, 2002, p. 95). This shifted the participant's perception of me and the interaction from focusing less on our friendship, and more on our new relationship evolving from the research.

As for in-person interviews, these were only a few and these were conducted with friends. I found these situations slightly more difficult to control, meaning the participants had a harder time treating the interview as distinct from our usual pattern of informal "friendly" interactions. The participants would allow themselves to be distracted by phone calls, text messages, or other just thoughts that took them away from the interview topic. But this was a minor issue, and corrected by gently steering the interaction back on course.

Overall, all the participants seemed comfortable, focused and open during their interviews. I attribute this in part to me having an insider position and friendship with the participants and also to the degree of control the semi-structured interview format offered to the participants. I have concluded for this study that the online interviews were equally effective as the in-person interviews, and that both generated useful and varied data on the participants' safety practices with regards to their cars and driving.

3.4.3 *Observations*

In deciding to conduct observations of the participants while driving, I hoped to generate data that would show car safety as it is practiced. This could then be compared with how the participants spoke about car safety, either enhancing my understanding of the patterns already detected or offering variations to consider. I understood that a researcher can never know more than the people she studies, but the researcher may "see different things than actors and natives" (Czarniawska, 2007, p. 21).

Again because of the project's constraints, the early observations were made remotely. I solicited the help of three participants, all of whom were friends, to record videos of themselves while driving. These video collaborators were chosen based on their

enthusiasm and openness during the interviews and on the type of driving routines they had which included their children. These participants produced video clips of what they considered common commute situations, and then delivered them to me via file sharing software. All of the videos were directed inwards into the vehicle cabin, making them particularly useful for viewing the driver as he or she interacted with people or things in the car and for giving a sense of the driver's emotions during their drives. They conveyed to me both the tedium of long commutes and the frustration of traveling with an impatient child. The videos as ethnographic data had obvious limitations though, as a result of the quality of the recording equipment (mobile phones and digital cameras) and the mounting devices available to the participants, and also as a result of what the participants chose or could manage to capture in video.

The in-person observations of driving practices were conducted when I was a passenger in the cars of three participants while they did their work commutes with their children, or other regular driving routines like weekend errands and transporting children to music practice. Additional observations were also made on-site at an elementary school, during its organized drive-thru drop-off/pick-up procedures before and after school hours. During this fieldwork I was able to observe the external conditions that surrounded the car and its participants, including family and work routines and variations in the traffic.

Although it was noted earlier, it is worth repeating that I found an "insider familiarity" with driving and commuting to be a challenge at times. During 30-45-minute-long observations of driving, it was difficult to remain attentive to the small, but possibly telling, details of the participants' practices. Therefore, the videos made by the participants, and some that I also recorded as a passenger, were helpful since they allowed for multiple viewings later. Another challenge that arose for me was the difficulty of being both an unobtrusive observer and friend while in the participants' vehicles:

> I was tucked into the back seat with Mike [the son], John was driving and Lisa was in the front passenger seat. As we started out driving on their way to do Saturday morning errands, Lisa asked me "do you want us to pretend you're not here?" I said yes, perfect. Mike had no problem ignoring me for the most part. But his parents could only ignore my presence for about five minutes. Then Lisa was telling me about Mike's piano lessons, and describing their Saturday routine to me. John chimed in also to add his own comments. (Fieldnotes)

In this fieldwork situation, and all the others when I was an actual passenger in the car, my presence became impossible to ignore. I was in fact a welcome distraction to the participants

during an otherwise uneventful routine, and like any other irregular distraction this presumably altered to some degree the drivers' behaviors by drawing their attention away from the task of driving.

Sociologist Marianella Sclavi (as quoted in Czarniawska, 2007) suggests that when using "shadowing", (a mobile variant of non-participant observation (Czarniawska, 2007)) as a fieldwork method, researchers should embrace the uncomfortable and unexpected situations that might arise from the unnatural social conditions created by observing; that these can be used as resources that permit "us to understand ourselves and other selves in interaction" (Czarniawska, 2007, p. 43). From taking this perspective, I understood that the friendship between the participants and myself was highlighted by the social nature of the car. Being in the small, intimate space of the car cabin with each other, it would have been more uncomfortable for the participants not to speak with me; the silence would have felt awkward and artificially imposed. During such observations, I embraced the unexpected; I accepted that my plan to be a non-participant observer (which to me meant interacting as little as possible with the participants during their driving routines) had to change, and that I would need to take on concurrent roles of friend and researcher/observer. Although I initially found this distracting, I decided that it was ultimately better for my research and my participants if they felt comfortable with the situation. In retrospect, these observations were successful despite and because of the interactions with the participants, since they showed me how the drivers dealt with distractions, myself included, and I could observe this as part of their safe driving practices.

To conclude, I found both the video and in-person observations to be complementary and essential for investigating car safety as a practice. The videos were particularly useful for watching, and re-watching, people perform their ordinary driving commutes, less encumbered by the researcher's presence. The in-person observations of the participants in their cars corroborated the data from the videos and, additionally, offered some opportunities to discuss in real-time what the participants were thinking and experiencing during driving. These on-site observations, and as well the observations made at school drop-off and pick-up areas, allowed me to see how driving and cars were incorporated into larger routines of family, school and work.

4. Theoretical perspectives

Business anthropologists Patricia Sunderland and Rita Denny (2007) remark on "the human capacity to spin, twist, turn, invent", and that the work of the cultural analyst is to elucidate the familiar and tacit cultural matters that may not be immediately obvious to either the researcher nor the research participants (p. 48). In order to do such work, I employ two theoretical perspectives which offer useful lenses through which to analyze the empirical material, magnifying certain details and clarifying their relationships with regards to car safety. Before delving into the analysis, this chapter presents a brief overview of these perspectives: actor-network theory and a conceptualization of trust as a mechanism for reducing social complexity.

4.1 Actor-network theory

From my fieldwork, I identified, in addition to the drivers and their cars, a number of people and things that factored into car safety. These entities were several and diverse and, at first, seemingly unconnected. Actor-network theory (ANT) proved useful for seeing these entities as nodes in a network, each one functioning and acting in terms of their relationships with the others, and indeed connected because of their roles within the network.

To be clear, ANT does not offer explanations of why things happen but rather provides a way to study things and what they do. ANT can be understood as both the tools and sensibilities for analyzing the world in terms of "material semiotics" (Law, 2009). It promotes a view of the world in which any phenomenon can be understood of in terms of the different "materials", human & non-human that are connected via the phenomenon, and in terms of the "semiotics" of the material relations—that these materials are only relevant to the phenomenon in as much as they interact with each other to create the phenomenon and in so doing mutually define each other.

In other words, any phenomenon, natural or social, can be understood as a "network" of relationships among a collection of "actors". Actors, as the name implies, act or perform a role within the network. They have agency, not in the way of a human's ability for meaningful and intentional acts, but because they have a capacity "to make a difference to a state of affairs" (Latour, 2005, p.53). With this definition of agency, the role of actor then need not be reserved for humans but can be distributed also to non-human materials. Additionally, a person or other entity is an actor only because it is constituted as such through its associations and work within the network. The actor is defined and made relevant through its interactions with other actors. This, again, is the allusion to semiotics, the study of signs

and their relations to each other. In ANT an actor is understood as “a semiotic definition ... something that acts or to which activity is granted by others” (Latour, 1996, p. 373). For his part, sociologist and science, technology and society (STS) researcher John Law (2009) refers to this as the “semiotics of relationality”, which describes how the elements of a network “define and give shape to one another” (p. 146). This relationality can also extend to the way the actor and the network are likewise interdependent and mutually shaping each other, for “an actor can not act without a network and a network consists of actors” (Stalder, 1997, p. 1).

In practice, ANT is a methodology that “traces associations” (Latour, 2005, p. 5) between disparate things in the world. Arguing against what he sees as limitations of more conventional sociological approaches, anthropologist and philosopher Bruno Latour (2005) posits that no *a priori* social domain exists, that there are no social forces or social aspects that can explain the unaccounted for phenomena in other domains. Instead there are always these “associations”, the interactions between “heterogeneous actors” that are not in and of themselves social, but which come together in unique “assemblages” and in turn create something social. ANT develops understanding of a phenomenon by picking it apart to identify the constituent parts, human or otherwise, and examining what work each one is doing in a “network of associations” (Latour, 2005).

ANT can be considered a post-constructivist, ontological approach for understanding what something is in terms of the shifting configuration of actors and relationships that define that phenomenon in a given moment. Latour (1987) proposes this as a way to study “science and technology in the making”. In my research, employing ANT allowed me to study car safety "in the making”, as it was being enacted through the work of a collection of actors. And although the data generated from the fieldwork did not allow for the type of intensely descriptive and highly detailed account most often associated with ANT studies, the data still permitted in conjunction with actor-network theory a way to identify and understand the actors and relationships which came together and enacted car safety. I found sociologist Michel Callon’s (1986a, 1986b, 1991) writings particularly useful for my analysis, more specifically for explaining the work, or “translations”, that happens among network actors. Additionally, philosopher and anthropologist Annemarie Mol’s (2002, 2010; De Laet & Mol, 2000) concept of the actor-network as “fluid” and as “multiple enacted realities” also proved helpful for understanding how car safety was enacted differently for different persons.

4.2 Trust as a complexity reduction

With ANT I was able to understand car safety as enacted by the gathering of actors and their associations in specific networks. Employing the theoretical lens of "trust" generated additional interpretations of my data as it revealed how embedded trust was in the networks. Sociologists Niklas Luhmann's (1979, 1988) and Bernard Barber's (1983) examinations of trust within the framework of systems theory were particularly helpful in understanding trust as a function through which a social system, such as an actor-network, might form and stabilize. Trust featured to varying degrees in all the actor-network relationships enacting car safety and proved to be a social mechanism integral to my analysis.

From Luhmann's (1979) perspective of functionalist system analysis, complexity is the main challenge to a system's stability. Complexity is understood to be an *a priori* condition of the environment and existence, and that a system emerges in its environment as a way to reduce complexity. For a contemporary social system, its environment, meaning the modern world, presents "an increase in complexity in space and time, manifested as the unimaginable superabundance of its realities and its possibilities" (Luhmann, 1979, p. 5). Put more simply, sociologists Lewis and Weigert (1985) in their theorizing about trust state the challenge of complexity as:

> It is not possible to develop plans of action which take into account all possible contingent futures. If all possible future events were accorded equal probability, the future would appear with such enormous complexity as to preclude rational action in the present. (p. 968)

Complexity then is a "problem of overload and of constantly threatened instability" (Luhmann, 1979, p. 6). An illustrative scenario would be when driving a car on the open road, a driver cannot possibly contemplate and prepare for all contingent futures: will my car work and continue to do so? will the driver and car in the adjacent lane stay in their path? will the truck driver behind me slow down when I do? is the road construction reliable? will the wildlife stay off the road? The list of possibilities continues.

In light of this, trust can be understood as an effective reducer of complexity within social systems. If one trusts in something, then there is no need to do the rational calculations of probability because the expectation of that thing is treated as if it were a certainty. In this formulation, trust is linked to both expectation and risk. Inherent in trust is the expectation of a specific outcome. However, also inherent in trust is risk, meaning the possibility that through a breach of trust not only are one's expectations disappointed but the new outcome is significantly worse than if the decision had been made to not trust. In

continuing with the earlier illustration, a driver on the road may (and most will) choose to trust that the car and its occupants will get to their destination safely. In so doing the driver need not confront the paralyzing complexity represented by multiple contingent futures, instead the driver will act having trusted in the certainty of a safe arrival. However, in trusting there is an awareness, either conscious or subconscious, that some component in the system may behave in an untrustworthy manner and place the driver in greater danger than if the choice had been to not drive at all.

Luhmann (1979) differentiates between "interpersonal trust"—a relationship between persons, and "system trust"—the attitude towards systems such as organizations or institutions. Interpersonal trust is a relationship between individuals in which at least one presents as trustworthy and the other decides to grant trust in return. System trust on the other hand presumes the functionality and reliability of a system, and allows trust to be placed in the function of the system rather than the individual people involved in it (Luhmann, 1979). In his later work, Luhmann (1988) states that system trust is in fact "confidence". Furthermore, given that confidence is the norm (one is confident that the bank is managing one's money responsibly, that the grocery market is stocked and will sell food, that cars will stay on the road and not swerve onto walking paths), it becomes "a matter of routine and normal behaviour" (Jalava, 2006, p. 28) and is often not explicitly acknowledged in our decisions and actions.

Luhmann (1979, 1988) points out that familiarity, a basic aspect of human experience, is a pre-condition for both trust and confidence; familiarity with the past is necessary to set expectations for the future. However, the important difference he draws is that trust presupposes a risk, as noted above. This risk is the *possibility* of having wrongly placed trust thereby exposing oneself to danger or harm. And if this negative outcome does come to past, the truster must blame himself for the wrong decision. Confidence in a system, on the other hand, also acknowledges the possibility of danger or harm should expectations be disappointed, but this does not equate to risk. When the system disappoints and negative outcomes emerge, this is caused by and attributed to system failure and not to the individual's decision to trust.

> The distinction between confidence and trust thus depends on perception and attribution. If you do not consider alternatives (every morning you leave the house without a weapon!), you are in a situation of confidence. If you choose one action in preference to others in spite of the possibility of being disappointed by the action of others, you define the situation as one of

> trust. In the case of confidence you will react to disappointment by external attribution. In the case of trust you will have to consider an internal attribution and eventually regret your trusting choice. (Luhmann, 1988, p. 97)

Ultimately the importance of trust in persons or systems is that it allows one to overlook ignorance and uncertainty, which are both inevitable in life. Trust "reduces social complexity by going beyond available information" (Luhmann, 1979, p. 93), because we can never know entirely what other people will do or how the future will unfold. Trust allows for "generalizing expectations of behaviour in that it replaces missing information with an internally guaranteed security" (Luhmann, 1979, p. 93). Luhmann (1979) argues that without trust only very basic forms of local co-operation are possible and only in the present; but trust facilitates a social system's potential for action and extends co-operation through time and space.

Barber (1983) while agreeing largely with Luhmann's main conclusions on trust, chooses to separate trust into three categories based on the expectations they invoke. There is "general trust", which is the expectation that the natural and the moral social orders will persist on a day-to-day basis. Secondly there is trust in the "technical competence" of those involved in the social relationships or systems. This is an expectation of competent performance of roles which may involve "expert knowledge, technical facility, or everyday routine performances" (Barber, 1983, p. 14). Lastly there is trust in "fiduciary obligations" entailing expectations that some people have a moral obligation and responsibility to place others' interest before their own, and this obligation "is placed on the holder and user of the special knowledge and skill with regard to the other members of his social system" (Barber, 1983, p. 15). Barber asserts these types of trust exist between individuals, between individuals and systems, and between systems, and that all three forms of trust function alongside each other in any social relationship but in certain situations one type of trust may be valued more. For Barber (1983) trust has a general function of social ordering, "providing the cognitive and moral expectational maps for actors and systems as they continuously interact" (p. 19).

Both of these conceptualizations of trust, as a reduction of complexity and as social expectations, were valuable for analyzing the ways in which trust was a foundation for the actor relationships that constituted the networks enacting car safety.

5. Enacting a safe car

To begin the analysis, I introduce two terms that proved helpful for organizing the empirical data. From the data, I realized that, for the study participants, car safety consisted of two distinct but connected aspects of safety. The first of these I termed "vehicle safety", which is about a quality that the participants attribute to the entity of the car. The second aspect I termed "driving safety", which does not refer to a driver's skills or awareness, but rather to what constitutes a safe driving situation; the term acknowledges the fact that participants speak of their cars being safe or unsafe in relation to the surrounding conditions.

In this chapter, I address vehicle safety, examining who and what the study participants included in their discussions of how safe their cars were. To begin, I briefly present the factors that impact vehicle safety, as they were spoken about in the interviews. Then section 5.2 establishes how these factors are incorporated into an ANT analysis and are important to identifying which actors come together in a network of vehicle safety. Section 5.3 describes what the actors do to construct the network, thereby enacting vehicle safety. Sections 5.4 and 5.5 bring into the analysis the concept of trust, and show how it is involved in the network actors' associations; and that trusting associations can stabilize a network, while breaches in trust can destabilize it. Lastly in section 5.6, I discuss how trust can be seen as essential to the formation of an actor-network enacting vehicle safety.

5.1 Talking about cars

To generate data on vehicle safety, my interview questions focused on the participants' experiences of purchasing a vehicle. Some of the broader questions posed were: what were the motivations for the purchase? What kind of vehicle qualities did they prioritize during the purchasing process, and how did they define and verify these qualities? How satisfied were they, in retrospect, with their purchase?

It is worth noting that of the nine families represented in the study, seven families had acquired a vehicle in anticipation of the birth of their first or second child, and safety was a consideration in their vehicle selection. As I had anticipated when I chose to study parents, the identity of being a parent had indeed caused a shift in these individuals' understanding of safety, car safety included, and it had foregrounded their responsibility to their children. This was exemplified in a statement by Lauren who compared the purchase of the family car with the purchase of her personal car which she had acquired prior to starting her family: "For me safety is the biggest concern. And it's completely different now than it was when, you know,

I got my Matrix [her personal car]. I didn't even look at the safety ratings when I bought the Matrix, right." (Interview 6)

In discussing how they evaluated whether their current family vehicles were safe or not, the study participants cited a number of factors that impacted their evaluation. These factors were distilled into five categories. The first of these was "recommendations from familiars"; this category reflects the value placed by some parents on the opinions and recommendations of friends or family members with regards to guiding a vehicle purchase. The second category, **"**statistics, ratings and reviews", groups comments on vehicle safety that stress the importance of gathering information from independent non-profits and specialty journals that assess a vehicles' capacity for safety. The third category includes responses from participants that described a reliance on "safety standards" for determining a vehicle's safety. For these participants, a belief that their vehicle complied with vehicle safety regulations negated the affirmation offered by statistics, ratings and reviews. For some participants "brand associations"**,** the fourth category, were significantly factored into which cars the participants considered safe or not safe. The fifth category covers "the feel of the car"*,* and refers to comments made by the majority of the participants that described safety in terms of how they experienced the car in relation to size, weight, solidity, stability, and metal.

5.2 Enrolling actors

To summarize the previous section, the influences on the study participants' determination of safety in their cars included: recommendations from familiars; statistics, ratings and reviews; government standards; brand associations; and the feel of the car. From an ANT perspective, these categories may be treated as so called "actants" in a network of vehicle safety.

Actant is a challenging concept; it is a non-human actor, but it is more than that. Latour (2005) explains that he lifted the term from literature studies and references Algirdas Julien Greimas' work. A brief investigation into Greimas' actantial model establishes that any action in a story, real or fictional, is composed of six components, or actants (Felluga, 2011; Hébert, 2011). Most relevant to the understanding of ANT, these actants are necessary for allowing an action to emerge and they may be represented by human, objects, concepts, or collectives. Latour (2005) clarifies that "for instance in a fable, the same actant can be made to act through the agency of a magic wand, a dwarf, a thought in the fairy's mind, or a knight killing two dozen dragons" (p. 54). In ANT, an actant is essential to its network for allowing the constituting relationships to emerge, however whatever entity acts in that function is

named an "actor". In other words, "any thing that does modify a state of affairs by making a difference is an actor—or, if it has no figuration yet, an actant" (Latour, 2005, p. 71).

The concept of actant is useful in my study for seeing the five categories cited earlier as important to a vehicle safety network. However, the figuration of say brand association could be advertisements, a past experience with the brand, a salesman at the dealership, or the company's website. With regards to which specific actors are in a vehicle safety actor-network, this depends on whose network is being established.

Callon (1986a) speaks of a "prime mover", an entity which is part of a network and in some ways is the initial organizer. The prime mover has a starting vision of what a network can and should be. It "puts forward a list of entities and a list of what they do, think, want and experience" (Callon, 1986a, p. 22) and "enrolls" these entities as actors in the network. In my analysis, each study participant is considered to be the prime mover of his or her own vehicle safety network. In this capacity, each participant decided which actors to enroll, what they would do, and how they would be interconnected in order to constitute a network of vehicle safety—*specific* to that person.

Take for example Scott and the actors he enrolled in vehicle safety. I asked him to tell me about the two Volvos he and his wife had purchased. He chuckled and responded "yeah, safety cars," and then after taking a moment to reflect he launched into an account of the vehicle purchases. His wife's vehicle, a 2006 XC90, had been bought in anticipation of their second child:

> So we wanted a bigger car to, you know, lug around all the stuff. And then at that point safety was on our radar for sure...we wanted to get a bigger car, a safe car. So that was the big thing for me, knowing that my wife's driving around in a safe car was really important. (Interview 10)

He went on to describe how for this purchase he relied on several sources of information: "word of mouth", meaning reviews from friends about "how safe the cars were"; also the dealership had provided helpful information about the car's safety features like airbags, and basically "how and why it's safe"; and lastly he had found a report online which had determined that Volvos were safe based on the least number of car collision deaths attributed to Volvo cars. When questioned further about his online research, he could not remember where he had found the report. "I would just do it online, just going around different reports." And later he reflected that he did not know if the report was outdated by now, or if it was even valid to begin with.

Still, given that he and his wife were very happy with the XC90, when the time came in 2013 to buy a new car he opted for a Volvo sedan, the S60. He did again some online research of the model, and relied again on the dealership for helpful information about the car's safety features. It helped that he "was familiar with the person at the dealership through [his] kids school", but he ultimately based much of the decision on his past experience with the XC90—and interestingly, because he had bought the same model two years prior. He described having owned another S60 a few years back. While driving it, he had been hit from behind so hard that the car had been totaled, damaged beyond repair. Nevertheless, he had not sustained any injuries, which surprised both him and his auto insurance company given the severity of the vehicle damage. "I barely felt it myself. I was fine. I got up and I was walking." (Interview 10) This was proof to Scott that Volvos were good cars. "I liked the car a lot and it's safe. And so I bought basically a newer version of the car." (Interview 10)

In the case of Scott, the actants involved in his network are recommendations by familiars, statistics, ratings and reviews, brand associations, and the feel of the car. The specific actors that are enrolled are friends who were familiar with the particular Volvo model, the dealership and its representative who informed him of his car's safety features, a statistical report that offered meaningful numbers of lives saved, and his own experience of feeling protected and safe. All of these actors contribute through their actions to forming and solidifying Scott's vehicle safety network.

In participating in this particular actor-network, each of these actors establishes a relationship with the driver and with each other as well. When friends account for their experiences with Volvo, they bolster the automaker's brand identity. The statistics that the driver has found online confirms the information he has received from the dealership staff. The dealership salesperson conveys information that also corroborates the opinions of the driver's friends and the statistical findings. Lastly, the driver's own experience with his car, dramatically put to the test due to the accident, gives rise to a feel of the car which substantiates the other actors' performances. Through their combined actions the driver and actors have *enacted* safety. For Scott, the Volvo S60 is safe (and he states it conclusively "it's safe") and he acts on this reality by purchasing another safe car.

It is important to recognize that each participant I spoke to defined and configured actors and relationships differently. Thus vehicle safety is different for different people. For example Kevin, primary mover in his own network of vehicle safety, enrolled his past experience with the Toyota brand: "It's a reliable car, reliable name brand." (Interview 9). He also enrolled the standard safety features of airbags and anti-lock brakes which assured him

the car had met regulated safety measures and the expert opinion of his car enthusiast friend. For this participant, these actors worked with him to construct the vehicle safety of a 2014 Toyota Corolla that could keep his 18-year old son protected in his daily driving. Alternatively, for Kate, her 2012 Subaru Impreza is safe because of the work done by the ratings she found online, a car review by the magazine Car and Driver, the information she received from the dealership salespeople, and the feel of the car (the car feels "solid", "stable", with good tire traction).

5.3 Translations in the actor-network

In recruiting actors, defining who they should be and what role they will play, the prime mover makes an attempt in "translation". Translation is the work being done which makes it possible for a collection of heterogeneous entities to become a network. Callon (1986a) indicates three components of translation: translation as "spokesperson", translation as "obligatory passage points", and translation as "displacement". The first of these translations happens when the prime mover defines the actors and their work, and in so doing the will, or objectives, of one actor is conferred to one or more other actors (Stalder, 1997); in this way, the former is enabled to speak for the latter. In the vehicle safety network, it is the driver who decides which entities to include in the network and what difference they will make through their work, and thus the driver translates the entities, constituting them as actors and speaking on their behalf. "The translator is thus the spokesman of the entities he constitutes" (Callon, 1986a, p. 25).

An example of this translation process emerges from the discussion Julie and her husband, Will, had about the 1982 Mercedes-Benz 300D they had purchased for family transportation. I asked them how did they know it was safe? The car was "used and old", which for Will meant that it was cheaper to buy and cheaper to insure and register. For Julie, "used and old" was a reference to the car's previous owner, Alfredo, a friend of relatives; this connecting backstory translated the car into being as familiar and reliable as its previous owner. Julie even mentioned that she had, in fact, named the car Alfredo. However, for Will, the previous owner's assessment of the car was not enough. He pursued further consultation on the car, turning to vehicle reviews in Consumer Reports and to a familiar mechanic for more concrete, and, in his mind, "valid" information.

Julie discussed also the value of the car's brand, Mercedes-Benz. This held a certain association of durability for her because the taxis in Gambia where she and Will had done missionary work were all "Mercedes Benz diesels, and we saw that they could take a lot of

punishment and abuse." (Interview 8) They both confirmed each other's account of the feel of the car—a lot of metal in a big car equated to strength, quality materials and construction, and protection. As Will said, "they're big and they're old and they're mostly metal ... knowing that it's a bigger car, I think a certain amount of sense of safety comes with [that]". (Interview 8)

From this conversation, it can be seen how each person by identifying and explaining the actors in his or her network, speaks for them and is their spokesperson. Additionally, one sees that although the same actor is enrolled in both networks, its translation may or may not be the same. The translation is variable depending on the spokesperson.

Callon (1986b) speaks of a "double movement" that happens when the prime mover decides on which entities to enroll, and also defines them in such a way that the prime mover becomes indispensable to the network being assembled. In this way the prime mover becomes an obligatory point of passage through which all entities must acknowledge and pass through if they are to be defined and enrolled in the network. This may happen in the way of "problematization", as in the driver postulating to the other entities, or would-be actors: in order to do your work, you will need me to be in a safe car while travelling. So if the government wants to keep its citizens well and alive on the nation's roadways and reduce the economic burden of injury and casualties, or if Volvo wants to maintain its brand identity and sell more cars, or if the car wants to remain the driver's car, each must commit to and work towards supporting the drivers' supposition. The obligatory point of passage asks the entities to recognize that their interests are the same, and that an alliance in keeping the driver safe will benefit all. This aligning of the actors in their work supports the formation and stabilization of the network, without which the actors could not exist.

The third component of translation is displacement. Displacement, for all intents and purposes, is the procedural work happening among the actors. Callon (1986a) speaks about the ways in which the work of an actor may be displaced. This happens when work is converted into "inscriptions", different texts or objects, which are then circulated in the network and acted upon or reacted to. For example, all the work that the Insurance Institute of Highway Safety (IIHS) does at its research center and test facilities—vehicle crash testing, measurements of damage to the car and crash test dummies, crash videos, and more—is displaced into the driver's livingroom via an inscription, a singular page on the IIHS website listing a particular vehicle's ratings, or a proud statement of superior IIHS rating written into an automaker's magazine ad. It can be said that the IIHS (including all its resources—people, things, actions) has been "mobilized". "To mobilize, as the word indicates, is to render

entities mobile which were not so beforehand" (Callon, 1986b, p. 216), and if mobilized, entities can be displaced. Thus, a mobilized IIHS has the possibility to be displaced to various settings, including a driver's home, via its inscriptions.

Other inscriptions identified by the study participants include car reviews, institutional car ratings, advertisements, vehicle specifications, regulations, opinions and complaints. The "movement" of these, and also the movement of people, materials and money, created displacements in the network. As the network gathers more inscriptions and displacements, it "accumulates materials that render it durable" (Callon, 1986a, p. 28).

Displacements also happen when the goals and interests of one actor supplants the goals and interests of another. As hinted at earlier, this happens when a prime mover defines and enrolls an actor, because any other definition of the actor has now been displaced by the prime mover's. It can also happen among other network actors. An example of this was described in an Automotive News article, which stated the IIHS had "developed outsize influence on the progress of vehicle safety" (Beene, 2015). The article related that the IIHS in aggressively increasing the rigor of its testing had surpassed the work of the National Highway Traffic Safety Administration (NHTSA), the federal agency which among other tasks is actually responsible for regulating vehicle safety standards. In so doing, the IIHS had become the *de facto* standard setter for safety in the automobile industry. From the perspective of ANT, the IIHS by circulating inscriptions —conducting its independent testing and publicizing the results online and in reports which were then repeated in other media— had made its presence and intentions known. Consequently, the NHTSA had to recognize that its work needed to align with those of the IIHS; that its goals had been displaced by the IIHS' goals. Additionally, the IIHS asserted its authority with the car manufacturers by aligning itself with both car owners and insurance companies who preferred and thereby validated the more stringent IIHS crash-test ratings. This then seduced the car manufacturers into striving to comply with the IIHS standards instead of their own or the NHTSA's standards, a displacement again—this time of the car manufacturer's goals by the IIHS's goals. (Beene, 2015). From these displacements, the IIHS positions itself to be a more prominent actor in a driver's vehicle safety network while at the same time possibly diminishing or removing the roles of safety standards and brand associations.

For the vehicle safety actor-networks to be assembled requires translations in all three areas: "to speak for, to be indispensable, and to displace" (Callon, 1986a, p. 28). In all these acts of translation the vehicle safety actor-network solidifies, and a safe car is enacted.

5.4 Trust in the actors

In this section, I bring trust into the analysis and argue that it is also involved in the process of solidifying a vehicle safety actor-network. When a primary mover is designating actors and defining their roles, this is a process of translation and it is also a process of deciding who or what to trust. Can Will trust Alfredo, the previous car owner? Can he trust Consumer Reports, or the Mercedes-Benz brand, or the way the car feels?

Using Barber's (1983) definitions of trust, the driver's decision of whether to trust or not is based on an evaluation of the actor's technical competence in determining vehicle safety and as well the actor's fiduciary obligation to value the safety of the driver in the car. Consider how Alan factored in a trust of standards for his purchase of the family minivan, a 2012 Honda Odyssey:

> I wouldn't buy it if I thought it wasn't safe, right. And one of the factors is with that class of car would be like roll-over, right, and traction-control and braking systems. So most of them are pretty much up to snuff. (Interview 3)

Alan is saying that his minivan is safe, otherwise he would not have bought it, and he "knows" this because most minivans, including his own, have been built to a certain standard. The trust implied in his statement revolves around the fact that there is a standard he considers for minivans and he trusts it. Or, to dig deeper, Alan trusts that the standard is an accurate measure of safety because he trusts the technical competence and fiduciary responsibility of the organization to develop the standard. Alan also trusts that his Odyssey has met the standard because he trusts the technical competence and fiduciary responsibility of the automaker to comply with the standard, and additionally he trusts the technical competence and fiduciary responsibility of the NHTSA to enforce this compliance. In this example one sees how Alan has employed trust in the enrollment of standards in his vehicle safety network.

Another such implication of trust occurred during a discussion with Lauren, in which we talked about the optional advanced driver assistance technology she had passed over in her purchase of a 2014 Subaru Forester. This segued into a conversation about her ambivalence towards the idea of self-driving cars. While she saw such technology potentially offering certain conveniences, she was less sure that the technology was safe or could offer safety. She concluded with:

> … I'm just kind of thinking about what would make it acceptable and desirable to me is, you

> know the official governmental studies that really show a difference. That would make a difference to me to see those. And not just claims. (Interview 6)

In this statement, she suggested that government studies are more valid and therefore more useful as an actor than the car manufacturer's claims. Indeed, Lauren never spoke about brand associations in her actor-network of vehicle safety. Although it is conceivable that the automaker, through its engineers, designers, and scientists, has the highest technical competence for understanding the safety of its own cars, it is the automaker's fiduciary obligation that she, the driver, questions.

Barber (1983) points out that with businesses in a market economy the public will have high expectations of technical competence but no direct expectation of fiduciary obligation to the public good. This connects with Luhmann's (1979) statement that "trust is founded on the motivation attributed to behaviour" (p. 41). It can be said that a business' obligation, or motivation, is to generate profit for itself and that any fiduciary actions towards customers is perceived *not as an intention* but as a secondary outcome of market competition. That Lauren would perceive the automakers as self-serving and prioritizing profits over safety is not far-fetched, as the automakers have a history of resisting NHTSA regulations of mandatory vehicle safety features presumably because of the financial cost to themselves (Lemov, 2015). So in Lauren's evaluation of actors' trustworthiness, the government's relative technical competence and high fiduciary obligations trumped rather soundly the automaker's technical competence and lack of fiduciary obligation. Accordingly, the former was granted a role in Lauren's actor-network of vehicle safety, and the latter was not.

In the case of valuing recommendations from familiars, the participants expected the fiduciary obligation inherent in family relations and friendships, and technical competence was evaluated in terms of a spouse's ability to research adequately or with a friend's ability to extrapolate useful information from their personal experiences or expertise. With ratings or reviews from non-profits like Consumer Reports or IIHS, and with government standards, there is also a fair expectation of technical competence and high expectation of fiduciary obligation as this connects to both the definition and motivations attached to each institution. And as noted above, with businesses there is an expectation of technical competence but no or significantly less expectation of fiduciary obligations. This may serve as an explanation for why all participants who discussed brand association in their networks described it as something that was useful but in need of support by ratings or reviews and to be confirmed by their experience of the feel of the car.

Ultimately, a driver's decision to trust an entity and enroll it into his or her vehicle safety network was an attribution of character to that entity. The driver had determined that the entity was technically competent and/or honorable in its interests. Which is to say that in a vehicle safety network, when the prime mover attributes to an actor an "identity, interests, a role to play, a course of action to follow, and projects to carry out" (Callon, 1986a, p. 24), it is an act of trust.

5.5 Confidence in the network

In addition to the participants evaluating the trustworthiness of the actors, trust can also be considered in the way actors trust the spokesperson and each other. By accepting its role and work in the network, an entity shows trust in the system—or system trust. Stated differently, the entity enters the network confident in the expectation that it and all the other actors will perform their assigned work. The value of safety standards relies on a trust in the automakers to have their vehicles in compliance. Statistics, ratings and reviews trust in the driver to use the inscriptions and make good purchasing decisions, and they trust in automakers to recognize the inscriptions popularity and validity and strive to improve their ratings. A wife does the research on vehicle specifications, ratings, and reviews trusting they are accurate and trusting that her husband, the prime mover of the network, will take her efforts seriously. It is worth noting that more relationships holding the network together means more trust is involved, and because of this the vehicle safety network becomes more stable and hence confidence in the safety of the car is stronger.

Keeping in mind that actors may breach one another's trust, and thereby destabilize the entire network to some degree. For Alan, his other car—a 2005 Honda Civic, had been purchased for among other things its brand association of reliability and its standard safety features. He described his disappointment with the feel of the car though, letting me know that it was less than comforting:

> There's a lot of external engine noise and you hear a lot of noise. And it can be really unnerving if you have some wind buffeting. Because you can feel that. And plus I think there's a lot of cheap plastic parts in that range of cars. ... the wheel well is like completely empty so you hear so much stuff and there's all this plastic. And even if the plastic's not like completely falling off, you hear these little creaks and [makes squeaking noise] and you know molding gets loose and stuff like that. And I don't think it should, because they're not that old. (Interview 3)

The case here is that the car was expected to be adequately safe, but over time the feel of the car betrayed these expectations. The car felt "noisy", "unstable", "plastic-y", "cheap", as if "falling apart". The feel of the car defied the prime mover's definition of what it should be. This can be seen as an actor "blocking translation" (Callon, 1986a), meaning that it defines itself differently than what has been dictated by the prime mover. With such an action the nature of the network will be inherently changed. For Alan, because the feel of his car did not maintain its job of feeling stable and solid, the entire network faltered because of it and subsequently the car felt less safe.

Another example of a breach of trust and blocked translation may be considered in the 2009 Toyota recall of 16 million vehicles (Rechtin, 2014). In certain models a mechanical problem with the accelerator pedal and floor mat had resulted in fatal crashes. That there was technical incompetence was undeniable, but it was the lack of fiduciary obligation to the public good that led to a congressional hearing. Investigations revealed that company executives were aware of defects in their vehicles and were not only slow to communicate the problem to the public but it was also suggested that they intentionally had covered it up (Maynard, 2010; Rechtin, 2014).

It might be said that the Toyota brand association while being enrolled in actor-networks of vehicle safety was in 2009 being co-opted into a different network to be translated in a different way by the congressional hearings. In the new translation the Toyota brand was defined as unreliable and dishonest, and this definition most likely carried over into the vehicle safety networks. Thus, the Toyota brand association could not be mobilized to perform its role with regards to vehicle safety in drivers' networks, and what once may have been a safe and reliable car began to feel less so.

5.6 To trust is to translate

Callon (1986a) notes that "translation is at first an endeavor" (p. 25), meaning that translations are initially *an attempt* to establish an actor-network. It is only *if* the actors accept their roles and settle into their work and relationships, that translation into a network can be achieved. If this happens, then the spokespersons, the obligatory passage points and the displacements have successfully aligned the interests and coordinated actions of the various actors. From the assembly of heterogeneous actors and their varied associations a stable network emerges. Thus the actors and their work are translated into a network that - for this analysis – enacts vehicle safety.

A successful translation can be seen as a "simplification". "The notion of

simplification is used to account for the reduction of an infinitely complex world by means of translation", and "indeed it is an inevitable result of translation" (Callon, 1986a, p. 28-29). In other words, through translation the diverse actors and interrelated associations become a network, and if this network is sufficiently stable then all its inner workings can be ignored, *simplified* into a "black box". Thus every actor-network if successfully translated is essentially a black box; the network "no matter how complex it is or how contested its history has been, is now so stable and certain that it can be treated as a fact" (Stalder, 1997). Which is to say that if the vehicle safety network is accomplished, the driver no longer needs to consider the ratings, the regulated safety features of the car, the collected ratings, reviews and opinions, the commercials or past experiences with the brand, or how the car feels moment to moment; she simply "knows" that her car *is* safe. Moreover, this safe car remains a black box until a situation arises in which one or more actors resist translation and fails to do the work needed for constructing a safe vehicle. Then the box cracks open.

Trust can also be seen as a simplification. This is both implied and inherent in Luhmann's (1979, 1988) assertion that trust is "a reducer of complexity". In trusting the car's ability to offer safety, the driver simplifies an overwhelmingly complex task of understanding and verifying the vehicle's construction, materials and safety features. The driver's trust displaces risk and uncertainty of a future in which the car's safety fails with a commitment to act on the presumption of expected outcomes—that the car is and will continue to be safe. Trusting the car is in fact a displacement of the driver's confidence in the functioning of other systems (of friendship, of the NHTSA, of the automakers, of independent non-profits, and of the driver's own senses) onto the car. In this way trust may be seen as an act of translation; and to trust in the safety of one's car is to establish a black box around the different systems that are integral in enacting vehicle safety.

Callon and Latour (1981) state "a black box contains that which no longer needs to be considered, those things whose contents have become a matter of indifference" (p. 285). This fits well with Luhmann's concept of trust; in trusting we give primacy to our own expectations of a future outcome and because of this any other possibilities in the future are made irrelevant and disregarded. Hence, from my analysis a safe car is understood to be a black box which hides an assembly of diverse actors, who enabled by their trust in each other to perform their expected roles, build a network of working relations from which vehicle safety is enacted. However, as mentioned previously, "driving safety"—meaning the conditions and environment in which a car is situated—must also be taken into consideration to understand how safe a car is.

6. Safety on the move

In this chapter, the second component of car safety, "driving safety", is addressed. I continue my analysis by investigating who and what are necessary for a safe driving situation. Section 5.1 begins with identifying the actants in a driving safety network, and notes that driving safety is situational. Section 6.2 describes how the vehicle safety network is present as an actor in the driving safety actor-network. Following is section 6.3, which examines the unique relationship embodied in a driver, meaning a car-human hybrid, and also includes discussions of the self-trust a driver has. Section 6.4 discusses various car passengers that are enrolled by the driver to perform safety, with special attention to the mobile phone and children as particularly troublesome passengers. Section 6.5 describes actors that are encountered out on the road and the various ways they may block the driver's translations, this includes accounts describing "time" and "the other driver" as entities uniquely positioned to destabilize the network of driving safety. The concluding section 6.6 argues that given the situational nature of safe driving, the actor-network constituting this practice should be understood as something fluid and adaptable.

6.1 Practicing safe driving

The data pertaining to safe driving came, in part, from the participants' discussions of their driving practices and also from accounts they gave of both positive and negative driving experiences. Additionally, observations of driving practices were conducted as a way to compare driving safety as it had been performed in the interviews with the manner in which it was performed in routine driving. What was indicated from the data was that safety in the car was present in certain driving situations and not in others, which is to say that being safe in the car is different if one is relaxed and cruising the highway during a family road trip versus lane-hopping through Friday rush hour traffic.

Often the participants spoke about the stress of driving. Although they did not always connect this to safety, I found that their descriptions and my observations of stressful driving situations, for example involving terrible traffic or a wailing infant, pointed to an unpredictability of changing circumstances that impacted negatively the participants' emotions and potential behavior. For this reason, the data regarding stressful driving situations is included in the analysis as a shift from a safe driving situation towards a less safe one. The participants also spoke about different factors impacting driving safety: "the car",

"the driver", "passengers of different sorts", "external factors" (weather, road and traffic conditions), "time", and "other drivers".

These influences may be seen as actants involved in a driving safety actor-network. Revisiting Callon's concepts of a prime mover and translations, one finds they apply in this network also. Which is to say a driver, acting as the prime mover, enrolls heterogeneous entities together in an attempt to build a network enacting driving safety. The driver assigns definitions and roles to the entities, as a way to establish itself as both spokesperson for the others and as an obligatory passage point through which the entities will agree to and pass through. As the entities enter the network and are transformed into actors, they may then re-negotiate their definitions and relationships with the driver and each other attempting to displace one's interest for another's, eventually either solidifying or destabilizing the actor-network of driving safety in the car.

However, it is worth noting the details of translation are more dynamic here than those described in the vehicle safety actor-network. By virtue of the car's mobility, the surrounding conditions in which the network finds itself are in constant change as the car moves through time and space. Changing conditions generate changes in the actors' relationships, resulting in an often rapid process of negotiated translations among the actors. In this way driving safety, as it is discussed in this analysis, may be understood as being situational, the network changes as the situation does. The more interesting details of this are discussed below.

6.2 The car: vehicle safety punctualized

In determining whether a driving situation is a safe one or not, the participants acknowledged the evident role their cars played. Driving a safe car contributed to being safe while on the road. While this may seem like a statement of the obvious, to trust one's car on the road is a simple decision only because of the simplification accomplished through translation. A safe car, as determined in the last chapter, is enacted by complex network; but it appears, translated and thus simplified, as a single actor in a larger network of driving safety.

Callon (1991) speaks of "punctualization", the process by which an entire network is converted into "a single point or node" in another network. As mentioned earlier, if translations are successful, a network solidifies in such a way that its actors, their associations and their histories, are concealed as a "black box". Callon (1991) states that the network qua black box "becomes self-evident"; it is something upon which everyone agrees because its

behavior has become predictable independent of its context. In this form of a black box, the network can now serve as an actor in other networks. The resources of the concealed network are punctualized and "offer a way of drawing quickly on the networks of the social without having to deal with endless complexity" (Law, 1992, p.385).

Every actor-network can be understood as both actor and network, thus the hyphen. It is just a matter of perspective. This was hinted at in the preceding section when I referred to how drivers evaluate the trustworthiness of different actors for the role they might play in vehicle safety. The brand association of Toyota or a rating from IIHS are singular entities enrolled as actors in the network of vehicle safety. However, both of these actors are but representatives of their own black-boxed networks. In the case of Toyota branding, this is a large and complex network made up of scientists, engineers, administrators, users, machinery, materials, facilities, communication strategies, a host of inscriptions, and more. These underlying actors and relationships build both the network and its trustworthiness. If this network is successfully translated and simplified into a black box, the driver need not acknowledge the multiple levels of actors and their work hidden inside, but can just relate to—or have confidence in—the black box now performing as a single actor and representing a reliable brand. But if a challenging situation arises, say a pattern of vehicular crashes and fatalities in Toyota cars, the black box is cracked open by a congressional hearing and the hidden network concealed in the Toyota brand is revealed, examined and potentially opposed. It can be said that "punctualization is always precarious, it faces resistance, and may degenerate into a failing network" (Law, 1992, p.385).

Although it is recognized that every actor in the driving safety actor-network is a black box that can be opened and examined further, for the purposes of this analysis what is of interest is the punctualized actor-network of vehicle safety. If the vehicle safety network is stable (the car is safe) it is a black-boxed actor and will appear as a single actor in the driving safety actor-network (safe road travel). Kate, as noted earlier, has a stable vehicle safety actor-network. Her safe Subaru Impreza is enacted by the connected and aligned work being done by the ratings she found online, a car review by the magazine Car and Driver, the information she received from the dealership, and the feel of the vehicles' solidity and stability. With regards to how safe her car was on the road she stated:

> It drives well ... it feels stable on the road. So the all-wheel drive, you know I've never had an issue feeling like the wheels are spinning or that—again we haven't had much rain, so it's not like I have severe weather to compare this too. But we feel like the traction on the road is

> really great. We luckily, knock on wood, we've never been in an accident. But it seems as though the material around the car feels pretty solid even though it's a relatively small car. That it could handle some impacts. The steering is really good. So I think for me, it's mostly the connection between, for this car anyway, the connection between the steering and the wheels in terms of like the feel of having control, feeling safe. *(*Interview 13*)*

For this driver, her safe car performs safety on the road by "driving well". It has good traction, it steers well, it feels solid and will sustain collision damage well. The Impreza can be seen as a vehicle safety network which is successfully enacting itself and can be black-boxed, in this way it can perform as an actor in the driving safety network and comply with the driver's definition of what it should be and should do.

At the same time as it is being translated by the driver, the Impreza also attempts its own translation of Kate. The car, or really the networks it represents, would translate Kate into an effective and cooperative driver. Additionally, the car wants to translate the other network actors too—into an ideal driving situation so it can then perform optimally: the roadway should be smooth and clear, the traffic a predictable and orderly flow, the weather good enough so that it does not challenge the car's capabilities, etc.

In this view, the car can be seen as vying with the driver to be the spokesperson for the network. The car would also define and designate roles to the other actors so as to create a safe driving situation. But, will the driver succeed instead?

6.3 The driver: a car-human hybrid

This question of whether the car or the driver is the spokesperson of the actors in the network of driving safety can be answered with: both *and* neither. In examining which entity is making the initial attempts at translation, endeavoring to define the others and assign their work, one finds that it is not the car alone nor is it only the human at the steering wheel. Rather it is these two actors, merged into a third and unique entity, which positions itself as the prime mover of the network.

Latour (2000) describes a "hybrid actor" as the folding of human and non-humans into each other. He is speaking of those instances when a technology and user mutually translate each other and a link is created that did not exist before, and to some degree this modifies those things which are linked. In such a mutual translation there are attempts to displace the goals or programs of the other, but what emerges is a new program specific to the two entities in their collaborative form. Latour (2000) gives the example of a gunman. Initially, there is a

man, irate and vengeful; and there is a gun, a chunk of metal with intricate mechanisms. But together they are a "gun-man" with the potential to kill, a full set of new capacities and possibilities arise that did not exist with either of the two original entities alone.

Similarly, a driver is a vehicle linked to a human. The "car-human" hybrid attains a type of mobility that was unattainable for the two entities if separated (see also Dant, 2005). Without the person the car remains a complex but inanimate object, and without the car the person has a significantly decreased capacity to cover distance and diminish time during travel. In merging, the driver combines and deploys seamlessly the resources of the two actor-networks "it" embodies. I use the pronoun "it" deliberately, here and later, to emphasize that in my analysis of driving safety a driver is a not a human, but rather should be recognized as a car-human hybrid.

This was exemplified in one mundane scene captured in a video of John and his 2007 Audi A4 negotiating their way through morning commute traffic:

> John was traveling north on Highway 101 towards San Francisco. He was listening to an audio book playing out of the Audi's speakers. It was sunny and there were four lanes of cars flowing in each direction. Traffic was moderately heavy but moving, the general speed was variable—speeding up and slowing down as off- and on-ramps appeared. Traffic in the Audi's lane slowed, and cars to the left of it streamed by. In a quick sequence of actions taking just a few seconds, John turned his head and glanced out to the side mirror. He then flicked the turn signal with his left fingers, gauged distances and speeds, pressed on the gas pedal and turned the steering wheel. John and the car slid smoothly into the next lane and sped up to merge with the faster flow of traffic. (Observation 3)

It is such an unremarkable action, but significant. The Audi of course could not have done this without John, nor could John move in this way without the car. In order for John and the car to change lanes, and eventually arrive at their destination, *necessarily involves both* the human and the vehicle and their coordinated actions and goals. It is this necessity that allows the hybrid driver to emerge.

It is also important to note that each hybrid driver acts specifically in relation to the configuration of human and vehicle, and that this hybrid only exists when enacted in the driving of the vehicle by the human. Take Kate again, when asked to describe safety in the car she referenced her first car and recounted why she thought it had been so great, and safe. At that time, she had just gotten her driver's license and decided to buy a used, diesel Mercedes from her boyfriend's father, a mechanic. She laughed as she recalled how when

merging into freeway traffic, other drivers would become irritated and honk their horns at her because the Mercedes could not accelerate quickly. In retrospect she described the car to me as being:

> ... like a tank. It was a great first car because it went really slow but it was super sturdy. ... a big huge tank of an old car. Like you can't really go very fast, but if someone hits you you're completely protected. Completely. Very strong metal around you. I felt invincible. (Interview 13)

For this participant, she became a safe driver in merging her newly developing driving skills with the capacities of the Mercedes. The car and Kate, as a hybrid driver, performed safety together by driving slowly while being big, sturdy and metal. *Together* they were "invincible". Later with the Subaru Impreza, the "Impreza-Kate" hybrid performed safety differently using Kate's more advanced driving skills and the car's capacity for traction and handling. Safety in this case was not performed in terms of protection and invincibility, but in terms of control over the road and weather conditions.

6.3.1 *A trusting driver is a confident driver*

Various participants stated that they trusted themselves as a driver, or that they were confident in their driving abilities. They spoke also about their confidence in the way their car behaved both in terms of its abilities and shortcomings. The trust or confidence these participants displayed is based on familiarity. Luhmann (1979, 1988) indicates that familiarity is an important precondition for trust, in the way that knowledge of the past serves to establish expectations for the future. That the driver encompasses both the human and the car actor-networks establishes familiarity with them. From this familiarity the driver can derive expectations of how the networks' resources, the human's skills and the car's capacities, will perform in a certain manner in the future.

Here is an account of Beth's familiarity with her 2000 Toyota Sienna. When I asked her to describe her average commute in the minivan, she did not take any time at all before offering a step-by-step series of description that was her morning routine.

> I get in the car in the morning. I put my purse down. I put my lunch or whatever, my coffee in the cupholder. Usually turn on the radio. I usually make sure my phone is charged and on silent. And I turn it over so that I'm not looking at it. Then I go. ... It's generally pleasant. I listen to the radio usually, either news, or sort of comedy, music, whatever. (Interview 11)

Later Beth also described for me that evening's driving. She had had "chauffeuring" duties for her two children. She had come home from work, had her kids eat and ready themselves to go, then piled them into the minivan. She had maneuvered through traffic caused by a freeway accident, dealt with her petulant son, and eaten her boxed dinner too—all while driving to soccer practice and ballet class.

In this discussion Beth in fact spoke very little about the minivan itself, it only served as a background for her daily tasks. The Sienna is familiar, it is trusted to perform as expected and as long as it does so it is a black box and need not be considered; it is only apparent in the way that it enables her to perform her routines. Beth is also highly familiar with herself. She stated that she felt she was a "decent" driver overall, but was also aware of her "distracted mom driving" at those time when her kids drew her attention away from the task of driving. However, that she was self-aware of this was a good thing. Which is to say, Beth was familiar with both her strengths and weaknesses as a driver and trusted herself to respond appropriately to future conditions. Beth's high degree of familiarity with the Sienna and with herself is the basis for the trust she invests in each network, and, thus, this allows the hybrid driver to trust itself to handle future driving situations.

The driver's self-trust is a form of system trust, a trust in the functioning of the intertwined networks of the hybrid. Which is to say the driver has confidence in itself, meaning car and human, to drive well, or safely; and so the driver enters the roadway performing these expectations. Alternatively, when there is less familiarity with one or both of the constituting actor-networks, then there is a less confident driver. This was the case with Beth and her husband's 2012 Ford Escape:

> I don't love driving it because I always feel like (pause) because I don't drive it that often, I don't remember where the lights are versus the whatever, all the, you know. It's not very complicated to figure out ... where (chuckle) the windshield wipers are, but it takes me a second to remember, to adjust it to the right speed or whatever. Whereas with mine, which I'm so used to driving, because I've been driving it for so many years. (Interview 11)

When questioned further on these experiences, it was apparent she thought the Escape was a fine vehicle, but she just didn't enjoy driving it because it was unfamiliar. Beth knew, or was familiar with, her own driving competences in connection with the capabilities of her Sienna minivan—how fast they could accelerate, what kind of braking power they had, and what kind of parking space they could fit into. In contrast, unfamiliarity with the Escape actor-network resulted in a less cooperative relationship between it and Beth, and thus a less

effective deployment of resources by the driver. Consequently, the Escape-Beth hybrid was a less trustworthy, less confident, and consequently less safe, driver.

6.3.2 *Familiarity with incompetency*

Interestingly, great familiarity with both the human's and the car's competencies *and incompetencies* seemed to lead in some cases to the driver trusting in the capabilities of one actor-network to compensate for the deficiencies of the other. For Alan and Marie, they spoke of their cars' safety as being compromised, as indicated by the feel of the car (light-weight, small, not solid, excessive vibrating on the road). However, despite representing an unstable vehicle safety actor-network, these cars were still being driven. It seems that being familiar with the incompetency of the car still offers a driver a way to formulate expectations of the future should the car fail. With this expectation in mind, the driver can then marshal the resources of the human, driving skills and experiences, to develop a reasonable plan of action for the present in order to prevent a negative outcome in the future. For Alan, his plan was to drive with more respect for the car's limitations, and for Marie to choose driving on surface streets which she perceived as less dangerous.

While Alan and Marie displayed concerned about how safe their cars were, other participants seemed relatively unconcerned about vehicle safety. John and Will spoke of being unconcerned altogether with the safety ratings of their vehicles, because for them vehicle safety was definitively linked to skilled driving. Will stated:

> [The car] is only going to be as safe as the driver. ... I wouldn't [care] how many airbags does this car have? That really wouldn't be part of my consideration. Not to say that I don't care about safety ... but I don't, whether it has 4 stars for crash, or 5 ... I'm not worried about that, I think that the better way is to be alert, to be a defensive driver. (Interview 8)

For these participants, basic safety standards in the car were enough and superior safety ratings were of little importance. For them the vehicle safety actor-network is not fully constituted until enacted in driving practice, completed by the enrollment of the driver whose performance of superior driving skills can counteract any inadequacies in the vehicle safety network.

Some participants, like Beth, acknowledged their own limitations as drivers, that they were often sleepy, distracted or not alert. They recognized a weakness in the driver's human actor-network. However, in most situations, the danger presented by this weakness was offset by the driver's familiarity with itself - which allowed for pulling the car off the road thereby

dissolving completely the compromised driving safety network, or in other instances the human might snap to attention and stabilize the network. In the case of Alan, whose minivan was equipped with advanced driver assistance technology, this resource from the car's actor-network was cautiously accepted and used to counter the human's tendency not to be alert.

From the participants' descriptions it seems that familiarity with both the human and car networks, including incompetencies, allows the driver to develop trust in its particular set of abilities and therefore to drive confidently; while as indicated in the previous section a lack of familiarity will negatively impact the driver's self-trust and confidence in driving.

6.4 Passengers and their rival translations

In defining itself, the hybrid driver also defines what kind of interactions, or associations, are possible for it to carry out with other network actors. It is the hybrid driver that acts as the prime mover of the driving safety network, assessing other entities and likewise defining them and deciding what work they can and should do towards creating safe driving conditions. But will the other entities agree to the driver's definitions of them or will they be defined differently? Will the entities align themselves with the driver's interest of being safe on the road and towards others, or do they have other interests that take precedence?

Consider the variety of passengers that accompany the driver in its journey. These can be people, mobile phones, food, coffee, the temperature controls, the car's entertainment system, the built-in GPS system. All of these were named during the interviews as entities in the car, sometimes largely forgettable (when accepting the driver's translation) and sometimes irritating and possibly dangerous (when resisting the driver's translation). A cup of coffee in the car can be a comforting or refreshing feature of the morning commute, in this way it complies with the driver's definition of it. On the other hand, a cup of coffee can a be a distraction to the driver, too hot or on the verge of spilling, and this represents a blocking of the driver's translation. Keeping in mind that actors are themselves each their own punctualized network, and as such an actor may in fact be trying to enroll the driver (or one half of the hybrid) into its own network even as the driver attempts to pull the actor into driving safety.

Of the many passengers that accompany a driver, the remainder of this section examines the two actors that the participants spoke about most frequently: the mobile phone and children.

6.4.1 *The mobile phone: a seductive actor*

It was a little after 8 a.m. when we climbed into the 2006 Volvo V50 parked in the driveway. Lisa had explained earlier that while she generally disliked it, she occasionally took business calls during her commute. While she dialed into her bi-coastal conference call, nine-year old Mike and I buckled ourselves in and waited. After some focused tapping and swiping on the phone, she managed put the call on speaker and on mute. She then placed the phone in a dashboard-mounted holder.

The voice of her colleague in New York could be heard now. Mike said something and his mother shushed him saying, “I can’t hear.” Lisa started the car engine, buckled in, and let the wipers sweep away the windshield condensation. Then she dug out white earbuds from her purse which she connected to her phone. She explained that the car did not have “fancy Bluetooth or speakerphone”, but the earbuds worked for now and with them she could hear the call clearly. But she realized that in using the earbuds, the phone’s mute had turned off. She preferred to have the mute on so ambient sounds, like turn signal clicks or traffic noise, wouldn’t disturb the other callers.

She stared intently at the phone, tapping and swiping the touch screen but failed to put the mute on. Silently she shook her head and waved her hands in exasperation, then held up her finger to signal that Mike and I should stay quiet. After a long moment, Lisa looked up from the phone and checked to the left for oncoming traffic. She pulled forward towards the street and then stopped, deciding to fuss with the phone again. After a minute she pulled out of the driveway, turning right onto the neighborhood street. Soon she pulled out the right earbud, and drove with one ear listening to the meeting and the other presumably listening to the situation in the car. Periodically Lisa would tap at the phone or adjust the earbud. Mike sat in silence until we arrived four minutes later at his school’s drive-thru drop-off area. Mike whispered good-bye to his mother, hopped out of the car and sprinted to the playground.

Clearly irritated, Lisa pulled forward in the drop-off queue and was whispering to me or possibly to herself, “It’s stupid I’m not on mute. How is that possible?! Why am I not on mute? OK, I got to pull over because it’s ridiculous. ... Very upsetting.” She pulled to the side of the school parking area and began a series of attempts to configure the phone’s functions as she wanted them, but in the end she drove off with the phone meeting on speaker and mute. With her colleagues’ voices as a backdrop she explained, “I don’t usually have this call. This throws me off. I wish I could just drive.” As she drove through the traffic on the surface streets, every stop sign or pause in traffic was an opportunity for her to try and figure out the unexpected disobedience of the phone. (Observation 6)

In this scenario, Mike is an agreeable actor. The driver would like him to be a quiet and well-behaved child and he is, and in doing so he is contributing to the overall safety of the driving situation. In contrast, Lisa's mobile is unruly. It is being asked to be a helpful tool for allowing Lisa to unobtrusively participate in a work meeting while safely driving the car. However, rather than being an attentive work colleague or focused driver, Lisa is instead a frustrated technology user engaged with her mobile. In a manner, the mobile seduced Lisa away from the driving safety network and disrupted her ability to merge with the car and become a safe driver. The mobile attempted, and succeeded to some degree, to draw Lisa into a different network, that of work and of communication technologies.

Many participants had strategies in place to resist translation by the mobile phone: by turning alerts off on their phones or in the case of Beth, simply placing her phone face down on the passenger seat was enough. In other cases, participants, like Lisa, chose to perceive a dual role in both networks, driving safety and the one represented by the phone, as an acceptable risk or as no risk at all. However, my experience in the car with Lisa driving and using her mobile made me silently, and sometimes nervously, question how attentive and safe a driver she was in this situation, knowing that research supports that drivers using their mobile phones, even hands-free, are less safe (see for example NSC, 2012).

In this case, fusing the phone with the hybrid driver resulted in ineffective performances in both of the competing networks. A co-worker who is driving performs differently than if she was sitting at her desk focused on her work. Likewise, a person on the phone is a different driver than she would be without the phone. Which is to say a car-human is a very different entity than a car-human-phone hybrid.

6.4.2 *Children: the needy actors*

Children, or even a single child in the car, especially if they were young, were described by participants as potential distractions. In an earlier description, Beth used the label of "distracted mom driving". This phrase indicated a way of driving that to her was less safe and that she performed in connection to her children's behavior. When asked to elaborate on this, she said:

> I'm either looking at them in the mirror to see if they have their seatbelt on, or why they're arguing, or what they're doing, or, you know, what's happening. And then like turning back and stopping short, you know, slamming the brakes on. (Interview 11)

Beth's children were described as noncompliant actors in the driving safety network the driver was assembling. Unlike Mike in the scenario presented earlier, these children resisted the driver's translation that they should be well-behaved and unobtrusive.

Similar scenarios were described by other participants, in which a crying infant, a fussy toddler or fighting siblings drew a parent's attention away from the task of driving. This was observed in the case of Kate and her 3-year old, Annie, during their evening commute.

> On the way home from work, Kate had picked up Annie from the grandmother's house in San Francisco where the little girl regularly spent two nights of the week. Annie was in her polka-dotted pajamas and strapped into her toddler's car seat, which was centered in the backseat of the car. She snacked on apple slices that she plucked out of the Tupperware box she was balancing on her knees. She chatted with Kate and gave an account of her day with grandma. Periodically Kate craned her neck, peering into the rearview mirror in such a way that she might glimpse Annie's face in the mirror. They were driving on surface streets, but at stop lights and stop signs Kate would turn around to interact with her daughter, lay a sweater on the girl's legs or take some fruit too.
>
> What was normally a 15-20 minute route to drive the 7.5 km from the grandmother's house to the freeway ended up being roughly 25 minutes longer due to especially bad traffic. By this time, 45 minutes into the commute, Kate had used her phone and Google Maps to change routes in an attempt to find a less congested path to the freeway. They were still stuck in gridlock though and Annie sat glassy-eyed in her carseat, motionless except for chewing on her bottom lip. Some minutes later, Annie asked that her bubble song CD be played, but her mother answered that they had listened to it enough. Kate looked over her shoulder and glanced at her daughter, saying "you can just go to sleep, sweet pea." Annie whined softly back "I just want to be home really right now". Kate verbally comforted her daughter as she made a left turn and the Google Maps voice blurted out directions.
>
> At this point Annie tipped her head back on the headrest and began chanting repeatedly in a loud and shrill voice "now, now, now ...". Kate muttered under her breath, "for God's sake", and then sighing she merged into the traffic funneling towards the on-ramp. As she drove, she continued to reassure Annie that they would soon be home and encouraged the toddler to nap. (Observation 5)

What is described here is an actor, Annie, who does not necessarily want to participate in driving safety. Annie does not want Kate to be a safe driver, rather Kate should be her mother. She also wants the car to be less practical and isolating. Instead, it should be a

fun place where she can hear and sing the bubble song as many times as she likes, and she can have a more engaging interaction with her mother. In reflecting on similar situations, Kate described how there were many times in the car when she also wished she could be more of a mother and less of a driver.

> Sometimes she'll ask me to tell her a story. She loves stories. She'll say "Mom, tell me a story." And I'll be "you know what Annie" —especially if I have Google maps on and I'm not completely clear on where I'm going—I'll be like "I'm driving and I really need to focus on where we're going. I can't tell you a story right now." ... And then other times she'll say "oh I dropped my sippy cup. It dropped, it dropped!" And I'm like "well, I can't help you because I'm driving."... I can't! I'm driving, I need to pay attention. So I'm constantly saying that to her which I think, sometimes I feel bad, like she's with me but she doesn't really have my attention. (Interview 13)

Kate must resist being an attentive mother in these situations. She must resist Annie's attempt to translate her as such and not be drawn into the network Annie would assemble. Kate instead carries out her part of being a driver in the maintenance of the driving safety actor-network.

The other participants also described their attempts to translate their children into compliant actors performing safety in the car, thereby resisting the alternative translation which separated them from the car and from driving. The parents generally used pacification tactics, by giving the children food or electronic devices which would keep the children engaged in movies or games. Other times more forceful tactics were deployed such as reprimanding the children and threatening later punishment. However, I also noted that sometimes the children did succeed in translating the driver; the driver hybrid would dissolve and the parent would become distinct either causing a less safe driving situation, or causing a completely different situation of a car pulled to side of the road and a parent dealing with his or her children.

6.5 The actors outside

In addition to various passengers in the car, participants also identified actors outside the car that could impact driving safety. Examples of these were weather conditions, road conditions, the traffic system and traffic itself, time and other drivers. These actors were familiar to the driver, but at times radically unpredictable and readily able to block the driver's translations. This might be seen in the way a smooth and clear roadway might change

quickly if an unexpected pothole or other obstruction suddenly confronts the driver, or how morning commute traffic slow and sluggish but predictable becomes something else when it is impossibly gnarled by road construction, rain, or some other cause.

To counter such resistance, participants described how an experienced driver, one that trusted itself and was familiar with possible variations in external factors, could formulate reasonable expectations of contingencies and drive accordingly. For instance, many participants pre-emptively used traffic reporting and traffic apps to gauge traffic and plan routes around unexpectedly bad congestion. Scott described that in snowy weather when the road was icy or visibility low, then he would shift to a more alert or aware mode of driving; presumably because he is familiar with past snow conditions and has expectations that possible dangerous situations are more likely during such weather. Kevin gave another example of an experienced driver's advantage. Recounting when he was "a new driver" with "no experience", he had been driving the speed limit on a rainy day and keeping with the general speed of traffic, but upon braking the car had hydroplaned.

> I hit one side of the road and then I hit the other side, like it went back and forth. Again it was really scary and I'm lucky that I wasn't hurt. But that's another thing when you ask me about safe driving, when it's raining I always slow down now. I'm more careful. I'm much more careful. (Interview 9)

His account describes how a driver with little experience, and little familiarity, with driving situations and its own capacities, is then less safe, or less able to perform its role in driving safety, than the driver that is more experienced and can adjust its actions to learned expectations of the situation and of its own capacities. While this may be obvious, what is interesting is that this familiarity allows the driver to trust in itself to manage the external factors and also passengers. It is a trust that the driver will be able to successfully translate the actors in the network, despite potential acts of resistance.

A network of driving safety with successfully translated actors, each aligned and performing as expected (per the prime mover's expectations) so as to create safety in that situation, would be this moment of John's evening commute:

> He drove along the freeway, with clear skies and the sun behind him. The road was also clear, traffic was moderate and moving at the speed limit. His iPhone was charging near his side but of no interest to him. The Audi rolled along smoothly. He was relaxed, one hand on the wheel and the other resting on the center armrest, but he was still alert - looking ahead but

> occasionally checking the side mirrors and glancing briefly at the cars passing him on the left. (Observation 7)

On the other hand, an unstable driving safety network is an evening commute that Lisa described. It happened a few years ago but stuck out in her mind as "one of [her] worst experiences".

> She remembered rushing to pick up her son from his after-school program by 6 o'clock. She didn't want to be late because it made her feel bad and indignant when his teacher "lectured" her about being late. Traffic was "pretty bad". It was raining hard. She pulled up the Waze traffic app on her mobile phone. She described it "as real-time, crowd-sourced reporting, and you get a lot more details" about traffic conditions. But she also mentioned that the app was stressful to use because of the sheer amount of information it relayed, "because there's so many things that pop up, telling you all the time there are hazards and rains, ... cops and you know whatever roadkill ... that's on the map." (Field notes and excerpts from Interview 4)

Lisa felt like she "was running out of time", and using the app and following its directives seemed to only make matters worse:

> The Waze app was telling me to take this alternative route so I could avoid all the heavy traffic. ... So that app ended up taking me to all these kind of backroads ... and then the app was wrong because part of the road was closed. So I had to loop back and then try to find my way back out, in heavy rain again ... everything was just like crazy. ... It was just really, really stressful because traffic was kind of bad, the weather was bad, the app was driving me crazy. (Interview 4)

In this scenario the road and weather conditions, the phone and its co-conspirator the Waze app, all were resisting the driver's translation of them. The rain had made the roads slick and visibility bad, the phone was distracting, and the app was misleading and distracting in a stressful way. This in turn had transformed the familiar route home to a "maze" of back roads and unfamiliar streets. Lisa herself, focused on being a responsible and punctual mother, was not successfully translated into a safe driver either. She was speeding and driving in a riskier manner. Her case illustrates how network actors through their interactions define each other, and not always in keeping with the driver's definition; and how each actor in failing to perform safety contribute to the overall instability of the driving safety network.

6.5.1 *Traveling in time*

As can be inferred from Lisa's worst-case scenario of driving, time was a critical actor in the network. She mentioned she was "rushing" because she was "late" and "running out of time". She elaborated later:

> All my stressful driving had to do with time, had to do with running out of time. So I mean, weather conditions [didn't] seem to impact me if I had time. I wouldn't care, I [would] adjust to be careful. I would always become stressed when I was pressed for time.
> (Interview 4)

Time is an actor that is necessarily involved in the actor-network of driving safety. This is so because driving a car, safely or otherwise, is in fact a specific performance of time and distance. In the act of traveling, a human and car translate distance and time differently than a human on foot, or on a horse, or on a bicycle; each of these is a different performance of time and space. Which is to simply say that driving a car often requires less time to cover the same distance than these other modes of transportation. Participants, when speaking about routine car travel, did indeed speak about distance in terms of time spent in transit rather than miles covered. In many cases when the driving safety actor-network was stable and the drive was going as expected, the time spent driving was a compliant actor—unremarkable and unremarked upon. In other situations, time is translated differently.

Scott's commute from home to work is roughly 40 kilometers and he stated repeatedly that he disliked it. This distance, consisting of some surface streets and a longer stretch on the freeway, would take 20 minutes to drive with minimal traffic. He explained "it's a short distance. That's why when, you know, there's nobody there, you can get there pretty quick. You can feel good about things." (Interview 10) However he stated with a bit of irony that on a "good day" of commuting this same distance took 45 minutes to drive, and furthermore that his usual morning commute was in fact anywhere from 50 minutes to an hour and 20 minutes because of stop-and-go traffic and distracted drivers on their phones. He found the experience to be "totally stressful" and "frustrating".

For Scott, it was not how far he had to travel to get to work that was a source of irritation but rather how long it took to do this. This was not an issue of being late to work either, as he did not have a set time to be at work. The drive just took *too* long. Time had been transformed by the stop-and-go traffic, and it would no longer comply with how the driver wanted to define it. In Lisa's situation time resisted her translation as well and instead was translated by the traffic, the rain, the Waze app, and the teacher. This different

translation of time has consequences for the driving safety. For Scott and Lisa, the driving safety network is replaced by a different one constituting stressful and possibly unsafe driving.

Other examples of the driver's attempt to translate time being thwarted were found in the participants' descriptions of the stress or frustration experienced when driving late to a wedding, driving lost on the way to a funeral, or driving rushed to the airport to catch a flight. In these scenarios, time has the ability to disrupt the hybrid and pull the human towards other networks, those of work, parenting, family obligations, or air travel. Consequently, the human does not perform effectively as part of the hybrid driver; it becomes less able to perform the translations necessary for the driving safety network, thus destabilizing the network and compromising the safe driving situation.

However, participants also described various tactics they used to retain time as a cooperative actor. In the case of delays in daily commute situations, time was counter-translated by the enrollment of new actors like audio books, podcasts, favorite radio programs and sometimes phone calls through which time was made useful or entertaining. In the general case of delays or being late, traffic reports and traffic apps also gave the drivers a way to translate time in their favor, in the way that providing alternative routes offered the drivers a sense of control over time and the situation.

6.5.2 *Distrusting the other driver*

As has been noted, the driver trusts itself. This trust is based on familiarity with the competencies of the car and the person at the wheel, and as well as familiarity with its own experience of different driving situations. This self-trust allows the driver to expect that it can and will safely manage future driving situations, meaning a successful translation of the passengers and external factors into a network that enacts safe driving situations. Additionally, self-trust also allows the driver to recognize when it cannot manage and consequently that the car and person should not be driving.

However, there is one entity that is difficult for a driver to translate, precisely because there is disturbing lack of familiarity with it. Several participants spoke about other drivers with distinct annoyance. During Scott's commute there was traffic, a mass of cars moving slowly but predictably and it was a familiar actor in his driving safety network. But there were times when a car and its occupant separated from the mass and acted in an unexpected way.

> A lot of times you have drivers that sometimes are not paying attention. And so they ... cut people off, and we have accidents probably every day. I see it on the side of the road. ... I'll see they're texting and they kind of just swerve over. Either they're not paying attention or ... I'm in their blind spot and they'll just move over. ...So if I see them I try to go away from them. (Interview 10)

In those moments when a driver breaks from the expected behavior, like being distracted by a mobile phone, it creates a number of potentially dangerous situations that Scott must now consider. Scott no longer sees the person texting in his or her car as a coherent part of the general traffic, instead it has become a discrete entity—an "other driver".

Luhmann (1979) speaks of "egos" and "alter egos", which for this analysis equates to drivers and other drivers. An individual is an ego that experiences the world in a unique manner, which is to say the ego becomes familiar with the world and behaves accordingly to the expectations that familiarity has established. And the alter ego is a separate, conscious entity that experiences the world *differently* and also has the *freedom* to behave differently. It is specifically this "freedom of action" which increases the complexity of the world for the ego, it is "an element of uncertainty in the behaviour of other people which is experienced as the unpredictability of change" (Luhmann, 1979, p. 22).

Will described the unpredictability of "the other driver" as "the unknown". While explaining that a safe car was not about vehicle safety but rather an outcome of driving safety, he indicated the latter was heavily impacted by the other drivers.

> I don't think I've ever been in, felt like I've been in an unsafe vehicle. But unsafe drivers, or unsafe conditions, maybe yeah. It's only going to be as safe as the driver. And that's the unknown: are they paying attention? Are they texting on their phone? Are they? (Interview 8)

He left the last possibility unsaid. Presumably because this could have been any one of a countless number of possibilities in which the other driver could be doing something other than driving safely. It is the other driver's freedom of action that increases the complexity of Will's driving situation, because Will must then consider a larger number of contingent futures. Will the other driver stray into a different lane? Will it hit Will and his car or will it hit the other car ahead? Will it put the phone down and be alert? There are in fact too many future possibilities for Will, as his own driver, to consider and reasonably respond to in the present.

From Luhmann's perspective, drivers like Scott and Will lack familiarity with the other driver and consequently find it difficult to form an expectation of its behavior. Because

of this, several participants, rather than trying to impossibly calculate whether the other driver would act in a trustworthy manner, chose to distrust the other driver. Luhmann (1979) states distrust is not merely a lack of trust, it is a functional equivalent of trust. That is to say that distrust also reduces complexity in the present by simplifying expectations of the future, although these become negative expectations. In deciding to distrust the person who was texting while driving, Scott formulated an expectation that this other driver would act in a certain way—dangerously. With this in mind, Scott could then plan his own action—to "go away". He would slow down, speed up, or change lanes so as to take himself out of proximity of the untrustworthy driver, so that its behavior could not impact on his own.

The other driver then can be seen as a challenging entity to enroll in a driving safety actor-network. Because of its unfamiliarity, and therefore its unpredictability, the other driver is not easily translated by the prime mover into a reliable actor that will perform safety in the network. For many participants, including Scott, a reasonable alternative is to then remove the other driver from the network altogether, by physically distancing themselves from it and thereby forcing the other driver to merge itself back into service of a less threatening actor, traffic.

6.6 A fluid actor-network

In concluding this chapter, I return to the idea of driving safety as being situational. Which is to say that what is safe driving in one moment may not be safe in another. Driving slowly in a residential area is being cautious and safe, while driving slowly on a Los Angeles expressway is rude and unsafe. Thus, the nature of a driving safety actor-network is to alter and adjust itself in response to changes in its situation.

De Laet and Mol (2000) introduce and mobilize the metaphor of "fluid" to discuss technologies/actors/networks that are "adaptable, flexible and responsive" to their surroundings. These objects are fluid because the associations that constitute them are fluid. Law and Singleton (2004) alternatively describe such an object as a "mutable mobile", which despite being transported over time and space is able to maintain itself precisely because it is flexible and changing; its constituting associations gradually shift and are adaptable rather than remaining constant and rigid.

The concept of fluid works well in the case of driving safety. Kevin's network of driving safety includes a fluid relation with traffic rules. When I asked him what kind of driver he was, he took a moment to ponder this and replied, "I don't consider myself like the best driver. But I consider myself OK, like safe. I feel like I'm a pretty safe driver overall. ... I

generally follow most of the traffic laws." (Interview 9) He went on to explain that he made an effort to follow safe driving rules—waiting a full three seconds at a stop sign, leaving a good distance between his minivan and other vehicles in front and back, and "scooting out of the way" of aggressive drivers. For Kevin, practicing safe driving meant following the normative traffic rules. And when I met him during my fieldwork, he was indeed a polite and conscientious driver during the situation I observed.

Although later he described a situation in which he thought breaking a traffic regulation would be warranted. He recounted a recent event when his route home had been blocked. He thought it was an accident scene and some police cars, something serious. So he made an illegal U-turn in an attempt to improvise an alternative route. "And right when I made the U-turn these two motorcycle cops came out of an alley and they were right on me." (Interview 9) Kevin was ticketed, and he was still angry about it.

For Kevin, he trusted—or had confidence—in the traffic system to facilitate safe driving situations; but Kevin also trusted himself to recognize when circumstances allowed a safe deviation from the traffic rules. For Kevin driving safety was fluid because his relationship with traffic laws could be fluid, flexible and adaptable to the conditions of the moment. Obviously, the police officers representing and constituting another actor-network mobilized the traffic law in a very different way. To say that a driving safety actor-network is fluid, is to say that the actors' relationships necessarily shift and adjust as a consequence of changes in time and place, the situation, in order to continue enacting safety.

Take for example again Kate's commute with her daughter, Annie. As Kate started up the Impreza, the human-car hybrid emerged. This driver then pulled out of the grandmother's driveway onto the busy San Francisco streets, and in the process assembled a driving safety network. Some of the actors initially enrolled were the driver, the passengers including Annie and the mobile phone, the estimated travel time, the route, the traffic, and the traffic system. All these actors were defined and successfully translated by the driver, each contributing in their particular capacity to safety in that moment and place. Although, as the drive progressed, the traffic started to rebel and became increasingly congested. This then initiated a change in relationships between the driver and traffic and the mobile phone. The phone was then translated differently by the driver, from a quiet and passive actor into a traffic guidance system. In this way the driver and phone formed an alliance in an attempt to regain control of the translation of the traffic. However, the traffic's rebellion also involved a rival translation of time, and the usually manageable evening minute commute was transformed into a frustrating eternity in stop-and-go traffic. This new performance of time then transformed

Annie into an impatient and needy actor, who in turn attempted to transform the driver into an attentive mother.

It can be said that the stability of a network is always precarious; “All it takes is for one translation to fail and the whole web of reality unravels” (Law, 2009, p. 145). However, in a fluid actor-network when one translation fails, new associations and translations emerge as a countervailing response. In Kate and Annie’s commute, a change in the driving safety network began with an alternative translation of traffic, which then began a cascade of changes and shifts in other network relations that turned the driving situation from safe to stressful. However, if the driver manages to, and of course it trusts that it can, return the actors to the definitions and roles originally designated for them or can envision assign new definitions and work for them to do, the driver can restore the dissolving network thereby re-establishing driving safety in that situation. It is the network actors’ capacities for flexibility and adaptability with regards to their network associations that lend to the fluidity of the network, and, therefore, to the stability of the network.

7. Discussion of findings

In this final chapter I take the opportunity to summarize my analysis and offer a few conclusions about the nature of vehicle- and driving safety actor networks. After which, I present some thoughts on possibilities for applying this knowledge, and for building upon it with future research.

7.1 Summing up: trust in the actor-networks

To review, the study participants identified various *actants* in their *vehicle safety networks* (recommendations from familiars; statistics, ratings and reviews; safety standards; brand associations; the feel of the car) and in their *driving safety networks* (the car; the driver; passengers, external factors, time, and other drivers). These actants perform through the agency of various *actors* (a spouse researching possible car purchases, a television commercial displaying the virtues of a vehicle, children fighting, another driver swerving out of its lane). A *prime mover* brings together a group of actors in order to establish a network. In the case of a nascent vehicle safety network, it is a prime mover's (a participant's) *familiarity* with the actors that allows it to develop expectations of the actors' future behaviors in which the prime mover can then place its *trust*. This trust, and also the trust existing between the other actors, facilitates both the *enrollment* of actors and enabling of their relationships. If there is trust, actors are enrolled, *associations* form, *translations* occur and vehicle safety is enacted.

A stable vehicle safety network is then *punctualized* and performs as an actor, the safe car, in a *driving safety network*. In this network the prime mover is the driver, a *hybrid* made up of the safe car and the human behind the steering wheel, who enrolls other actors into the network. The driver has a dual *familiarity*, with itself and with past experiences of the other network actors, that establishes the *driver's self-trust*. This is the driver's trust in itself to manage its future responses to the various actors and their shifting network relations. These actors' relations are continuously changing because the conditions surrounding the network are continuously changing, as an inherent outcome of (auto-)mobility. Consequently, all the actors in the driving safety network, including the driver, are in a constant and *fluid* process of adapting themselves and altering their relations. Thus, driving safety is enacted moment to moment according to the situation.

Returning now to the questions of "what is a safe car?" and "how does a driver 'know' this?", what I have argued in this thesis is that when a person says she "knows" her

car is safe, this is actually a trust in the car's safety. And by trusting in car safety, she trusts in a black box which contains the two interrelated networks of vehicle- and driving safety made up by a multitude of actors and the way they trust and associate with each other. It is these actors and their relationships that are in fact being trusted by the person, and through trusting them a safe car is enacted.

7.1.1 *Trust offers control*

In some ways trust is about control, making the future more predictable and therefore more controllable. Familiarity offers knowledge of the past which then generates predictions of the future, but trust bridges a remaining gap created by ignorance of things that are unknowable. A person knows what it and other actors are doing, but not what they *will* do. Trust reduces the complexity created by ignorance—one's inevitable inability to calculate the many ways the future might play out—by offering a more limited and reasonable range of possibilities for consideration, which are the generalized expectations of the day-to-day functioning of natural and moral social orders, the competent performance of roles from people and collective entities, and the fiduciary obligations being upheld by certain people.

A person trusts in the safety of his car because he trusts in the actors and associations that constitute the network that enacts a safe car. Furthermore, this person trusts in the safety of the car during any given driving situation, because he trusts in his and his car's joined capabilities to translate the relevant actors and their associations in a way that is necessary to constitute a network that enacts a safe driving situation. Trust in these actor-networks allowed the study participants to forego considering the many different ways in which car travel could go horribly wrong, and in a sense this is a form of control over the future as the participants have control over what outcomes need to be considered. A person like Kate, who said "for me it's mostly the connection ... between the steering and the wheels, in terms of the feel of having *control*, feeling safe" (Interview 13), is trusting. This is the driver's self-trust, its trust in both car and human, to master and control any driving-related contingencies ahead in time and on the road.

7.1.2 *Multiple actor-networks, multiple realities*

As may have been gathered in reading this thesis and is now addressed here, from an ANT perspective, there are multiple vehicle- and driving safety actor-networks. There is not one vehicle safety network describing a definitively safe car. There are many vehicle safety networks each one enacting a safe car. The safety of Alan's Honda Odyssey is real and the

safety of Lauren's Subaru Forester is also real, but they are different.

Mol (2010) states "reality differs between sites". In her research on atherosclerosis, the disease was a different object and different reality depending on where it was constructed and by whom. The general physician, the surgeon, the pathologist in the lab, the patient, each generates different practices in relation to the disease, and "each practice generates its *own* material reality" (Law, 2009, p. 152). This is ANT's shift from epistemology to ontology, away from multiple interpretations of an object to recognizing multiple enactments of an object - which unavoidably leads to multiple realities. (Law & Singleton, 2004)

So there is no one way for a car to be safe. There are many safe cars, each enacted differently through its own actor-network. Likewise, there is not one way to drive safely. The driving safety actor-network is enacted in many places, at many times, and by many drivers. As the configuration of factors changes, new enactments of driving safety emerge. Scott, a driver with a specific set of skills and confidence, and an assembly of actors enact driving safety in certain way when he is in his sedan commuting home on a snowy, winter evening. When Scott is in the family SUV heading to the Washington coastline on a sunny weekend, a different driving safety is enacted by a different assembly of actors; and of course if his wife is driving, another different driving safety is enacted.

From a broader perspective, vehicle- and driving safety are also performed and enacted differently when the actor-networks are constituted by a vehicle designer, or a traffic system planner, or a gas station mechanic, or a mother of a child killed by a drunk driver. These actor-networks constitute multiple realities of vehicle- and driving safety, "brought into being, sustained, or allowed to wither away in common, day-to-day, sociomaterial practices" (Mol, 2002, p. 6).

7.1.3 *Intersecting actor-networks*

It is important to recognize that any actor-network of vehicle safety or driving safety exists and performs with other actor-networks. Actor-networks may "intersect" each other, and in doing so they conflict with, overlap, or merge with one another. In keeping with material semiotics, these relationships then mutually impact and define the interacting actor-networks. Take for instance Marie, who drove a "little tiny Cracker Jack box" (Interview 12) of a car; she used this metaphor to suggest her car offered little safety protection and would crumple like a flimsy cardboard snack box in the event of a collision. Marie appreciated the practical size and fuel efficiency of her Ford Focus but considered it relatively unsafe,

however she justified her vehicle purchase this way:

> We weren't really in a position at that time to be picky. We kind of had a really small budget ... And Craigslist, anything that was decent went within a couple of hours right, so we lost a handful. And then my husband jumped on this one. (Interview 12)

For Marie, her vehicle safety network was significantly unstable because it intersected and was impacted by her family-economics actor-network. Intersections may also occur between a vehicle safety actor-network and an actor-network constituting an individual's identity or status. This was the case for John, who when purchasing his car, an Audi cabriolet, would not compromise his architect's appreciation of visual aesthetics by purchasing an "ugly" car like his wife's Volvo V50, even if this meant his vehicle had a lower safety rating (and for this participant, vehicle safety was a function of driver skill, see p.39). Lisa, his wife, on the other hand, described her responsibility as a parent to find the safest car possible, and combining this with practical considerations ended up researching and selecting her Volvo station wagon.

Another example of intersecting actor-networks emerges from my fieldwork observations at elementary school drive-thru/drop-off areas. In one observation, Lisa's son was belted into his seat while wearing his over-sized backpack, which seemed unsafe if a rear collision would have occurred likely causing the boy whiplash. However, he said he always did this, and it turned out to be an expedient measure towards achieving his quick drop-off and the mother's quick get-away. Similar behavior was observed at a vehicle pick-up area outside of a San Francisco elementary school.

> Parents rolled up to the curb holding up a white sheet of paper to their windshield, on it the name of the child(ren) to be picked up. The school principal who was monitoring the pick-up that wet day was wearing a microphone head-set. She would read out the name of the child and it would echo inside the school lobby where the students waited sheltered from the wind and rain. When a child was called, he or she sprinted out to the waiting parent in the car. Some cars would depart from the queue even as the child was still shutting the car door. One minivan pulled away from the curb, its electronic side door just starting to close. I watched the child inside swaying and walking to his seat struggling to get his backpack off, while another car efficiently pulled into the now vacated spot at the curb. (Observation 14)

What may in most driving safety networks be considered a destabilizing performance was permitted in these situations because the parent drivers' actor-networks of driving safety had intersected and yielded to the schools' actor-networks of an efficient and convenient,

traffic-jam preventing, vehicle drop-off/pick-up routine. In such situations, driving safety gave way to expediency.

Other examples of intersections between different actor-networks can be taken from case descriptions offered earlier in this thesis. Lisa's driving safety was impacted by her work actor-network and the mobile phone actor-network (p. 41-42), and Scott's driving safety actor-network was impacted by the commuter traffic actor-network and by the other driver actor-network (p. 49). In all these cases, vehicle safety and driving safety actor-networks are being translated differently, altered, by another actor-network—be it family finances, a person's self-identity, a school's organized routine, work or another driver. It is possible that in these translations the vehicle safety- or driving safety network may dissolve entirely and the former actors are co-opted into the other networks, or actors may adapt to the new translation and continue to perform vehicle- or driving safety but in a different form.

7.2 Implications for future cars and future vehicle technologies

I believe understanding car safety as actor-networks, recognizing the actors involved and how trust and distrust impact their relationships and thus the networks, offers possibilities for considering how to introduce and encourage trust in new and unfamiliar vehicle technologies, both semi- or fully autonomous drive, such as those being introduced by Volvo and other automakers. My findings offers a useful perspective for thinking about 1) the impact that an unfamiliar vehicle technology might have on an existing driving safety network, and 2) what an actor-network enacting a safe vehicle technology might look like.

The majority of the study participants found the idea of ceding control to a self-driving car to be disturbing. My thesis findings suggest that introducing autonomous drive technology into an existing driving safety network represents a disruption of the car-human hybrid driver and the trust the hybrid has for itself. The hybrid driver is disbanded in a self-driving car, because the technology has enabled the car to take control from the human. In this way, the essential constitution of the driver changes, and for the human there is little or no trust in the new version of the driver because of the unfamiliarity of the new technology. In some ways the new technology has created an "other driver", unfamiliar and unknowable, and the cause of increased complexity in the human's situation. Since there is no foundation for trust, distrust in the technology emerges as an alternative complexity reducer. Distrust allows the human to formulate an expectation that the technology will fail, which results in the logical conclusion to *not* use it.

But a question arises: even if the technology is unfamiliar, could it be designed to make itself knowable? This is not to say people need to know how the vehicle technologies work (for it is indeed unknowable for the average layperson), but rather people may value knowing what the technology is actually *doing and planning* at any given moment. Already much of this is happening, the most recent car models have dashboards that are alight with various displays to let the person know what the advanced driver assistance technology in the car is monitoring and responding too. In this way the person is being informed of what the car is doing in the moment. But could the technology also inform the person of what it is intending to do and what other cars in the vicinity are doing and intending to do? This would address the distrust in other drivers the participants in my study articulated, which was based on their perceiving unexpected actions in the other driver and, additionally, not knowing what (possibly endangering) action would then follow. It would be interesting to consider that the distrust people have of autonomous drive technology is based on not only their anxieties of what a self-driving car will be capable, but also of what the self-driving car's intentions are.

With regards to an actor-network that enacts a trusted, and therefore safe, vehicle technology, I refer back to a vehicle safety actor-network. From my analysis, it can be said that a person's trust in the different actors is critical for establishing a network which enacts a safe car. A person "knows" the safety of his car indirectly through the trust it has for the network actors: a safe car is a trusted car. It is worth considering whether these actors and actants involved in enacting a safe car can also be enrolled and translated to enact safe and trusted vehicle technologies (in the U.S.).

Take for example "brand association", various marketing efforts show that automakers are currently leveraging their branding to generate trust in their existing advanced driver assistance systems and as well their future autonomous drive technologies. For instance, Volvo's marketing suggests that because Volvo is the brand to provide safety and sleek Swedish design in cars, it may also be trusted to provide safe and well-designed vehicle technologies; the company promises it is "redefining safety, every day" and that its technology will offer "safer journeys made more enjoyable" (Volvo Cars, n.d.-b). Whereas if one has in the past trusted in Audi to deliver urban cool and hipness in its cars, then one can also trust that Audi will deliver fun, exciting and intelligent vehicle technologies; Audi's marketing slogan asserts for its customers "intelligence is the new rock and roll" (Logan, 2016). In this way, brand associations are currently positioned as an actant in emerging networks constituting trusted vehicle technologies.

Another actant, "statistics, ratings and reviews", which is given agency through such actors as the IIHS, Consumer Reports and various industry magazines and websites is also already performing in the networks of trusted vehicle technology. The actors are enrolled because they are familiar and trusted by consumers, and they are actively testing and gauging the effectiveness of current ADA and then creating inscriptions to publicize and circulate the results. In this way, statistics, ratings and reviews are contributing to the enactment of safe and trusted vehicle technologies. On the other hand, "safety standards", has yet to be engaged as an actor in the trusted vehicle technology networks. In order to increase public acceptance of the technologies, safety standards and specifically the U.S. government as an actor will need to be enrolled and translated. A number of study participants discussed how they would like to have government produced statistics, regulated safety standards, and legislation on liability issues related to the new technologies. These yet unperformed actions by the government are needed to build a system around the technology that people can have confidence in, which is preferable to trusting in the technology alone. For if people were to trust in the technology and it failed resulting in a terrible outcome, they would blame themselves for trusting and having taken that risk. Will explained it this way when asked if he would use a self-driving car:

> Well, I guess I have mixed feelings. I mean of course from the legal standpoint if an automated car gets in an accident is the driver still responsible? Well, if the driver's still responsible which I think they would say, well then I don't know, if I'd want to risk getting a ticket or risk getting in an accident in some technology that could fail. (Interview 8)

However, if people had confidence in the system behind the technology, they would not blame themselves should the technology fail but could rather blame the automakers and the government that did not prevent the failure.

Lastly, there is a possibility to better mobilize the "recommendations of familiars" as an actant in the network of trusted vehicle technologies. The trust that one has in a friend, family member, or other familiar person may be transferred to the recommendation that person offers. Carrie described how in evaluating new vehicle technologies she very much relied on recommendations of familiars.

> I know what really helps me to build more confidence or [to be] motivated to try something new, is if I've had trusted friends or family members that have tried it out before me. ... I have a lot of friends that are engineers and designers, if they were to try it out and then show me or explain to me why this is good and safe, that would speak volumes to me. (Interview 1)

Carrie went on to describe how she would like to see dealerships actually incorporate recommendations by familiars in their sales strategy, she suggested "family and friends incentives ... that there could be some incentive for [a satisfied customer] to be able to test drive the car with their family members". (Interview 1) Carrie's suggestion then is to use trust in recommendations from familiars as a way to compensate for a lack of familiarity in the technology. A trust or distrust that a friend has in vehicle technologies then becomes one's own trust or distrust.

In short, my findings suggest that an ANT perspective can be useful for understanding how new and unfamiliar vehicle technologies could impact current driving safety situations, and as well what might be done, which actors might be enrolled and mobilized, to assist in the introduction and acceptance of these technologies. These suggestions are based on my particular exploratory cultural analysis of car safety, and are meant to recommend possible and different ways of thinking about the challenge of establishing trust in vehicle technologies when no familiarity exists.

7.3 Limitations of my research and suggestions for future research

Before discussing future research, I would like to briefly address the limitations of my own research. For this, I return to the concept of the field as constructed. The field's construction is only complete and recognizable when the research ends (Hirvi, 2012). Only then can I reflect on how my decisions as a researcher (from framing the research topic and scope, to which fieldwork methods to use, up until what data to include in the analysis) constructed and bounded the field. This leads me to reflect further, on how my decisions were aspects of my interactions with things and with people—interactions with Volvo researchers, with study participants and their cars, with my computer and its software, with pens, papers and my camera, with theories and their authors, with academic colleagues, and more.

Given this, I understand my research project to be its own actor-network, constituted and held together by heterogenous actors and their associations with each other. In as much as it a unique actor-network, it then enacts a very specific analysis of car safety which explores how American, middle-class parents enact safe cars and safe driving, alongside an assembly of other people and things. What my research then does not analyze are issues of class, gender, ethnicity or age with regards to car safety, nor does it cover vehicle- and driving safety actor-networks constituted in other locations like an automaker's vehicle

research and development facility, or an car insurance company's offices, or a driver training school's classrooms.

The actor-network constituting my research offers only one interpretation of car safety. Naturally, there are many other possibilities for producing different interpretations. From the interviews and observations with the participants, I believe there is more to be learned about car safety from a phenomenological perspective. What was hinted at in the data, in particular in discussions about the feel of the car, is that a person experiences space, time, movement and herself through the capacities of the car. In the development of new vehicle technologies that aim to offer safety benefits, it would be useful to understand how people currently experience safety through their cars.

Another possible research angle suggested by the data would be to explore driving safety as one aspect of a larger driving practice. I believe Michel de Certeau's (1988) concepts of "strategies" and "tactics" would be useful for interpreting drivers' practices as a way of managing or even opposing the constraining strategies imposed by government and other institutions, which manifest as traffic rules, road systems, work schedules, and even school drop-off/pick-up routines. Such an analysis could offer an interpretation of how safe driving supports or conflicts with a driver's tactics.

Future research might also shift focus to the particularities of car safety enactments by different types of people and in different locations not covered by this research project. For instance, research into American teenagers' actor-networks of vehicle- and driving safety might offer a useful cultural analytical perspective on the disproportionately high rate of collisions and collision fatalities for this age group (IIHS, 2013), and the resulting findings might be applied to adjusting driver training methods and aims. Additionally, an ANT analysis of multiple enactments of vehicle- and driving safety could produce not only interesting comparisons, but also insights into how these multiple realities of car safety in fact co-exist together. Mol (2010) speaks about the way actor-networks "hang together", that there is "coordination", "attuning" and "adjusting" and as well "friction" and "conflict". I myself used earlier the word "intersecting", as a general term for the way actor-networks perform alongside and with each other, mutually influencing or interfering with each other. Thus, research into how car safety is being enacted on the roads of Liberia, an African nation with a relatively high number of road traffic deaths (WHO, 2015), with enactments of car safety in the national and local offices of Liberian safety administrators and at the headquarters of the World Health Organization in Switzerland where there is concern about a "road traffic injury epidemic" (WHO, 2015), would indicate how the various actor-networks

hang together and where they intersect. Such findings could then be applied toward creating better coordination between the networks so as to have a positive impact on car safety in Liberia, thereby reducing the country's number of road traffic injuries and death.

A last suggestion for future research would be to take a very different tack, and examine how other modes of transportation are enacted. In considering the potential consequences of increasing car ownership—more environmental pollution and more traffic congestion, it would be worthwhile to trace the associations that enact public transportation. For example, identifying the actor-network enacting, say, the Los Angeles public transit system, as assembled by bus and train passengers, bus drivers, car drivers, city planners, traffic planners, etc., would indicate which associations are stabilizing and which are destablizing to the network. Also, looking at multiple enactments of this transit system would determine whether the intersections among the networks are coordinated or conflicting interactions. The analysis outcomes might suggest better coordination of the networks actors and their associations in such a way as to reverse a decade-long decline in transit ridership, despite the recent $9 billion dollar investment in new subway and light rail lines (Nelson & Weikel, 2016). Such research might be applied toward reaching Los Angeles County's long-term transportation goal of reducing single occupant vehicles and offering viable transit alternatives (Los Angeles Country Metropolitan Transportation Authority, 2009).

7.4 Final thoughts

In carrying out this research project and in writing this thesis I wanted to make a contribution to the lively and varied discussions, both in academia and in the mainstream public, on what the future of car driving might be. In presenting a cultural analytical perspective on how safe cars and safe driving is enacted today, my wish is to inspire different ways of imagining how safe cars and safe driving might be enacted in the future; and that these imaginings might both complement and challenge how car safety is being enacted in the research that neglects the social life of things, like that of the car. I follow in the footsteps of later ANT researchers by saying my goal has been "not to finally, once and for all, catch reality as it really is. Instead, it [has been] to make specific, surprising, so far unspoken events and situations visible, audible, sensible" (Mol, 2010).

8. References

Anderson, J.M., Kalra, N., Stanley, K.D., Sorensen, P., Samaras, C., & Oluwatola, O.A. (2014). *Autonomous vehicle technology a guide for policymakers.* Retrieved from http://www.rand.org/content/dam/rand/pubs/research_reports/RR400/RR443-1/RAND_RR443-1.pdf

Atkinson, R., & Flint, J. (2001). Accessing hidden and hard-to-reach populations: Snowball research strategies. *Social Research Update,* (33), 1-1. [Retrieved from http://sru.soc.surrey.ac.uk/SRU33.html]

Barber, B. (1983). *The logic and limits of trust.* New Brunswick, NJ: Rutgers University Press.

Beckmann, J. (2005). Mobility and safety. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 81-100). London, England: Sage Publications.

Beene, R. (2015, March 2). IIHS outruns NHTSA as pacesetter in safety. *Automotive News.* Retrieved from http://www.autonews.com/article/20150302/OEM11/150229866/ iihs-outruns-nhtsa-as-pacesetter-in-safety

Bertoncello, M. & Wee, D. (2015). *Ten ways autonomous driving could redefine the automotive world.* Retrieved from http://www.mckinsey.com/industries/ automotive-and-assembly/our-insights/ten-ways-autonomous-driving-could-redefine-the-automotive-world

Biernacki, P., & Waldorf, D. (1981). Snowball sampling: Problems and techniques of chain referral sampling. *Sociological Methods & Research, 10* (2), 141-163. doi:10.1177/004912418101000205

Bull, M. (2005). Automobility and the power of sound. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 243-259). London, England: Sage Publications.

Callon, M. (1986a). The sociology of an actor-network: the case of the electric vehicle. In M. Callon, J. Law & A. Rip (Eds.), *Mapping the dynamics of science and technology: sociology of science in the real world.* (pp. 19-34). London, England: Macmillan Press.

Callon, M. (1986b). Some elements of a sociology of translation domesticationof the scallops and the fishermen of St Brieux Bay. In J. Law (Ed.), *Power, action and belief: a new sociology of knowledge?* (pp. 196–229). Boston, MA: Routledge and Kegan Paul.

Callon, M. (1991). Techno-economic networks and irreversibility. In J. Law (Ed.), *A sociology of monsters: essays on power, technology and domination* (pp. 132-161). London, England: Routledge.

Callon, M. & Latour, B. (1981). Unscrewing the big Leviathan: how do actors macro-structure reality and how sociologists help them to do so. In K. Knorr-Cetina & A. V. Cicourel (Eds.), *Advances in social theory and methodology: toward an integration of micro- and macro-sociologies*. (pp. 277-303). Boston, MA: Routledge & Kegan Paul.

Center for Disease Control and Prevention. (2016). *Ten leading causes of death and injury.* Retrieved on August 10, 2016 from http://www.cdc.gov/injury/wisqars/leadingcauses.html

Clarke, C. (2007). *Driving women: Fiction and automobile culture in twentieth-century America.* Baltimore, MD: John Hopkins University Press.

Czarniawska-Joerges, B. (2007). *Shadowing: And other techniques for doing fieldwork in modern societies*. Malmö, Sweden: Liber.

Dant, T. (2005). The driver-car. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 61-79). London, England: Sage Publications.

Davies, C. A. (2002). *Reflexive ethnography: A guide to researching selves and others.* London, England: Routledge.

Davies, J. (1999) Race, cars, films and Los Angeles as (post) modern city. In Ghent Urban Studies Team, (Ed.), *The Urban Condition: Space, Community, and Self in the Contemporary Metropolis.* (pp. 202-212). Rotterdam, Netherlands: 010 Publishers.

de Certeau, M. (1988). *The practice of everyday life.* (S. Rendall, Trans.). Berkeley, CA: University of California Press.

de Laet, M. & Mol, A. (2000). The Zimbabwe bush pump: Mechanics of a fluid technology. *Social Studies of Science, 30*(2), 225-263.

Edensor, T. (2005). Automobility and national identity: Representation, geography and driving practice. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 101-144). London, England: Sage Publications.

Enevold, J. (2003). *Women on the road: Regendering narratives of mobility* [Doctoral dissertation]. Göteborgs Universitet/Karlskrona Tekniska Högskola, Sweden.

Eyerman, R. & Löfgren, O. (1995) Romancing the Road: Road Movies and Images of Mobility. *Theory, Culture & Society vol 12* pp 53-79 DOI: 10.1177/026327695012001003

Felluga, D. (2011) *Modules on Greimas: On Plotting. Introductory Guide to Critical Theory*. Retrieved from http://www.purdue.edu/guidetotheory/narratology/modules/greimasplot.html

Fia Foundation. (2016). *Fuel economy state of the world 2016: Time for global action.* Retrieved from http://www.fiafoundation.org/media/203446/gfei-state-of- the-world-report-2016.pdf

Gilroy, P. (2001). Driving while black. In D. Miller (Ed.), *Car cultures* (pp. 81-104). Oxford, England: Berg.

Greene, M.J. (2014). On the inside looking in: Methodological insights and challenges in conducting qualitative insider research. *The Qualitative Report, 19*(29), 1-13.

Greenough, J. (2016, June 15) Ten million self-driving cars will be on the road by 2012. *Business Insider.* Retrieved from http://www.businessinsider.com/report-10-million-self-driving-cars-will-be-on-the-road-by-2020-2015-5-6?r=US&IR=T&IR=T

Harwell, D. & Mufson, S. (2016, January 5). U.S. car sales hit record high in 2015. *The Washington Post.* Retrieved from https://www.washingtonpost.com/business/economy/us-car-sales-hit-record-high-in-2015/2016/01/05/363aaf30-af14-11e5-b820-eea4d64be2a1_story.html

Hébert, L. (2011). *Tools for text and image analysis: An introduction to applied semiotics.* (J. Tabler, Trans.). Retrieved from http://www.signosemio.com/documents/Louis-Hebert-Tools-for-Texts-and-Images.pdf

Hirvi, L. (2012). Multi-sited fieldwork among Sikhs in Finland and California: Researching the offline via the online. In L. Hirvi and H. Snellman (Eds.), *Where is the field? The experience of migration viewed through the prism of ethnographic fieldwork* (pp. 23-44). Helsinki, Finland: Finnish Literature Society.

Insurance Institute for Highway Safety. (2013). Unpublished analysis of 2008 data from the U.S. Department of Transportation's National Household Travel Survey, General Estimates System, and Fatality Analysis Reporting System]. Arlington, VA. Retrieved from http://www.iihs.org/iihs/topics/t/teenagers/fatalityfacts/teenagers/2014

International Energy Agency. (2009). *Transport, energy and CO^2: Moving towards sustainability.* Retrieved from https://www.iea.org/publications/freepublications/publication/transport2009.pdf

Jalava, J. (2006). Trust as a decision: The problems and functions of trust in Luhmannian systems theory [Doctoral dissertation]. Department of Social Sciences, University of Helsinki, Finland.

Jones, D. J. (1970) Toward a native anthropology. *Human Organization: A Scientific Quarterly for the Study of Development Change, 29*(4), 251-9.

Katz, J. (1999). *How emotions work.* Chicago, IL: The University of Chicago Press.

Labaree, R. V. (2002). The risk of "going observationalist": Negotiating the hidden dilemmas of being an insider participant observer. *Qualitative Research, 2*(1), 97-122. doi:10.1177/1468794102002001641

Latour, B. (1987). *Science in action: How to follow scientists and engineers through society.* Cambridge, MA: Harvard University Press.

Latour, B. (1996) On actor-network theory. A few clarifications plus more than a few complications. *Soziale Welt*, *47*, 369-381.

Latour, B. (2000). *Pandora's hope: Essays on the reality of science studies.* Cambridge, MA: Harvard University Press.

Latour, B. (2005). *Reassembling the social: An introduction to actor-network-theory.* New York, NY: Oxford University Press.

Laurier, E. (2005). Doing office work on the motorway. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 261-277). London, England: Sage Publications.

Law, J. (1992). Notes on the theory of the actor-network: ordering, strategy, and heterogeneity. *Systems Practice, 5* (4), 379-393.

Law, J. (2009). Actor-network theory and material semiotics. In B. S. Turner (Ed.), *The new Blackwell companion to social theory* (pp. 141–158). Malden, MA: Blackwell-Wiley.

Law, J. & Singleton, V. (2005). Object lessons. *Organization*, *12*, 331-355. doi:10.1177/1350508405051270

Lemov, M. R. (2015) *Car safety wars: One hundred years of technology, safety and death.* Madison, NJ: Fairleigh Dickinson University Press.

Lewis, J.D. & Weigert, A. (1985). Trust as social Reality. *Social Forces, (63)*4, 967+985.

Logan, B. (2016, March 17). Audi says intelligence is the new rock and roll. *Business Insider.* Retrieved from http://www.businessinsider.com/audi-intelligence-is-the-new-rock-and-roll-ad-2016-3?r=US&IR=T&IR=T

Los Angeles Country Metropolitan Transportation Authority. (2009). *I want a mobile future: 2009 Long range transportation plan.* Retrieved from https://media.metro.net/ projects_studies/images/final-2009-LRTP.pdf

Luhmann, N. (1979). *Trust and power.* Chichester, England: John Wiley & Sons.

Luhmann, N. (1988). Familiarity, confidence, trust: Problems and alternatives. In D. Gambetta (Ed.) *Trust: Making and breaking cooperative relations* (pp. 94-107). Oxford. England: Basil Blackwell Ltd.

Mashaw, J.L. & Harfst, D.L. (1990). *The struggle for auto safety.* Cambridge, MA: Harvard University Press.

Maynard, M. (2010, February 24). An apology from Toyota's leader. *The New York Times.* Retrieved from http://www.nytimes.com/2010/02/25/business/global/25toyota.html?_r=0

Miller, D. (2001). Driven societies. In D. Miller (Ed.), Car cultures (pp. 1-34). Oxford, England: Berg.

Mol, A. (2002). *The body multiple. Ontology in medical practice.* Durham, NC: Duke University Press.

Mol, A. (2010). Actor-network theory: Sensitive terms and enduring tensions. *Kölner Zeitschrift für Soziologie und Sozialpsychologie. 50* (1), 253-269.

Muoio, D. (2016, April 7). Here are all the companies racing to put driverless cars on the road by 2020. *Tech Insider.* Retrieved from http://www.techinsider.io/google-apple-tesla-race-to-develop-self-driving-cars-by-2020-2016-4/#google-has-never-given-a-formal-deadline-but-has-suggested-its-working-on-having-the-technology-ready-by-2020-3

National Highway Traffic Safety Administration. (2013). *Preliminary statement of policy concerning automated vehicles*. Retrieved from http://www.nhtsa.gov/About+NHTSA/Press+Releases/U.S.+Department+of+Transportation+Releases+Policy+on+Automated+Vehicle+Development

National Highway Traffic Safety Administration. (2015). *Critical reasons for crashes investigated in the National Motor Vehicle Crash Causation survey.* Report no. DOT HS 812 115. Washington, DC: National Center for Statistics and Analysis. Retrieved from https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115

National Highway Traffic Safety Administration. (2016). *2014 Motor vehicle crashes: Overview.* Report no. DOT HS 812 246. Washington, DC: National Center for Statistics and Analysis. Retrieved from http://www-nrd.nhtsa.dot.gov/Pubs/812246.pdf

National Safety Council. (2012). *Understanding the distracted brain: Why driving while using hands-free cell phones is risky behavior.* Retrieved from http://www.nsc.org/DistractedDrivingDocuments/Cognitive-Distraction-White-Paper.pdf

National Safety Council. (2016). *NSC Motor Vehicle Fatality Estimates.* Itasca, IL: Statistics Department National Safety Council. Retrieved from http://www.nsc.org/NewsDocuments/2016/mv-fatality-report-1215.pdf

Nelson, L. J. & Weikel, D. (2016, January 27). Billions spent, but fewer people are using public transportation in Southern California. *The Los Angeles Times.* Retrieved from http://www.latimes.com/local/california/la-me-ridership-slump-20160127-story.html

Noy, C. (2009). On driving a car and being a family: An autoethnography. In P. Vaninni (Ed.), *Material culture and technology in everyday life* (pp. 101-114). New York, NY: Peter Lang Publishing.

O'Dell, T. Raggare and the panic of mobility: Modernity and everyday life in Sweden. In D. Miller (Ed.), *Car cultures* (pp. 105-132). Oxford, England: Berg.

Ohnuki-Tierney, E. (1984) "Native" anthropologists. *American Ethnologist, 11*(3), 584–6. doi: 10.1525/ae.1984.11.3.02a00110

Packer, J. (2008). *Mobility without mayhem: Safety, cars and citizenship.* Durham, NC: Duke University Press.

Rechtin, M. (2014, May 25). What Toyota learned from its recall crisis. *Automotive News.* Retrieved from http://www.autonews.com/article/20140525/OEM11/305269965/what-toyota-learned-from-its-recall-crisis

Rothe, J.P. (1994). *Beyond traffic safety.* New Brunswick, NJ: Transaction Publishers.

Saupe, A. (2010). Human security and the challenge of automobile and road traffic safety: A cultural historical perspective. *Historical Social Research*, *35* (4), 102-121.

Seiler, C. (2008). *Republic of drivers: A cultural history of automobility in America.* Chicago, IL: The University of Chicago Press.

Sheller, M. (2005). Automotive emotions: Feeling the car. In M. Featherstone, N. Thrift and J. Urry (Eds.), *Automobilities* (pp. 221-242). London, England: Sage Publications.

Spector, M., Bennet, J. & Stoll, J.D. (2016, January 5) U.S. car sales set record in 2015. *The Wall Street Journal.* Retrieved from http://www.wsj.com/articles/u-s-car-sales-Poised-for-their-best-month-ever-1451999939

Sunderland, P.L. & Denny, R.M. (2007). *Doing anthropology in consumer research.* Walnut Creek, CA: Left Coast Press, Inc.

Stalder, F. (1997). *Actor-network theory and communication networks: Towards convergence.* Unpublished manuscript, Faculty of Information Studies, University of Toronto, Canada. Retrieved from http://felix.openflows.com/html/Network_Theory.html

United States Department of Transportation, Bureau of Transportation Statistics. (2015). *National transportation statistics 2015.* Retrieved from http://www.rita.dot.gov/bts/sites/rita.dot.gov.bts/files/publications/national_transportation_statistics/html/table_01_11.html

Volvo Cars. (n.d.-a) Autopilot [Company webpage]. Retrieved May 30, 2016, from http://www.volvocars.com/ au/about/innovations/intellisafe/autopilot

Volvo Cars. (n.d.-b). Intellisafe [Company webpage]. Retrieved June 30, 2016, from http://www.volvocars.com/intl/about/our-innovation-brands/intellisafe

World Health Organization. (2015). *Global status report on road safety 2015.* Geneva: WHO Press. Retrieved from http://www.who.int/violence_injury_prevention/road_safety_status/2015/Section_3_GSRRS2015.pdf?ua=1

9. Footnotes

[1] The task of calculating the number of cars worldwide, or nationwide for that matter, is not an exact science. However by all accounts the numbers are rising. It should be noted though that the definition of passenger vehicles, also called light-duty vehicles, varies depending on the organization or agency and what limitations each puts on the qualifying weight or chassis length of a passenger vehicle. This to some degree is the reason for the differences in reported numbers. The Fia Foundation and IEA describe a light-duty vehicle as being primarily for personal use and the transport of passengers, this would generally be vehicles with seven seats or less and include "sedans, personal pick-up trucks, high-performance sports cars, mini-vans, and sport utility vehicles (SUVs)". (IEA, 2015)

[2] The U.S. Department of Transportation changed its definition of passenger vehicles in 2007 to include light duty vehicle, with both short (equal to or less than 121 inches [3.07 meters]) and long (greater than 121 inches [3.07 meters) wheel bases. This includes cars and all classes of vans, pick-up trucks, and sport utility vehicles. (BTS, 2015)

10. Appendix A: List of study participants

Participant*	Gender, occupation & age	Vehicle primarily used	Children living at home, listed by age	Type of household	City/region of residence
Carrie	Mother, homemaker, age 50	2012 Honda Odyssey (minivan)	20, 16, 14, 9	2 parents, 1 income, 4 vehicles	Belmont, California/ San Francisco area
Alan	Father, pastor, age 54	2001 Volvo V70-XC (station wagon), 2005 Honda Civic Hybrid (sedan)			
Lisa	Mother, project manager/architect, age 48	2006 Volvo V50 (station wagon)	9 yrs	2 parents, 2 incomes, 2 vehicles	San Carlos, California/ San Francisco area
John	Father, architect, age 54	2004 Audi A4 (coupe)			
Lauren	Mother, genetic counselor, age 48	2004 Toyota Matrix (sedan)	3 yrs	2 parents, 2 incomes, 2 vehicles	Berkeley, California/ San Francisco area
David	Father, video editor, age 51	2014 Subaru Forester (compact crossover)			
Julie	Mother, homemaker/student, age 49	1982 Mercedes-Benz 300D (sedan)	11, 5	2 parents, 1 income, 2 vehicles	Mill Valley, California/ San Francisco area
Will	Father, facilities management director, age 48	1983 Mercedes-Benz 300D (sedan)			
Kevin	Father, school principal, age 50	2001 Honda Odyssey (minivan)	20, 14	2 parents, 2 incomes, 3 vehicles	San Francisco, California
Scott	Father, manager of records & information management, age 43	2013 Volvo S60 (sedan)	11, 9	2 parents, 2 income, 3 vehicles	Kenmore, Washington/ Seattle area
Beth	Mother, medical interpreter, age 43	2000 Toyota Sienna (minivan)	11, 8	2 parents, 2 incomes, 2 vehicles	Seattle, Washington
Marie	Mother, senior grants manager, age 40	2007 Ford Focus (sedan)	8, 5	2 parents, 2 incomes, 2 vehicles	Edmonds, Washington/ Seattle area
Kate	Mother, teacher, age 37	2012 Subaru Impreza (sedan)	3 yrs	2 parents, 2 incomes, 1 vehicle	El Cerrito, California/ San Francisco area

*** 13 participants in total (4 couples, 5 individuals), representing 9 families in total; fictitious names are used to prevent participants from recognizing each other**

11. Appendix B: Fieldwork log

Interviews, semi-structured, conducted by J. Tong

Reference number	Repondent	Vehicle primarily used	Interview date, duration, location
1	Carrie	2012 Honda Odyssey (minivan)	13/07/2015, 00:36:46, in-person at her home
2	"	"	06/10/2015, 00:49:58, online at her home
3	Alan	2001 Volvo V70-XC (station wagon), 2005 Honda Civic Hybrid (sedan)	08/08/2015, 00:38:27, online at his home
4	Lisa	2006 Volvo V50 (station wagon)	15/08/2015, 01:16:46, online at her home
5	John	2004 Audi A4 (coupe)	03/10/2015, 00:48:37, online at his home
6	Lauren	2004 Toyota Matrix (sedan)	16/08/2015, 00:47:30, online at her home
7	David	2014 Subaru Forester (compact crossover)	28/08/2015, 01:02:16, online at his home
8	Julie & Will	1982 & 1983 Mercedes-Benz 300D (sedan)	25/01/2016, 0:26:06 in-person at their home
9	Kevin	2001 Honda Odyssey (minivan)	20/09/2015, 01:11:33, online at his home
10	Scott	2013 Volvo S60 (sedan)	28/09/2015, 01:00:40, online at his work office
11	Beth	2000 Toyota Sienna (minivan)	24/09/2015, 01:05:43, online at her home
12	Marie	2007 Ford Focus (sedan)	16/09/2015, 00:39:44, online at her home
13	Kate	2012 Subaru Impreza (sedan)	11/09/2015, 00:52:55, online at her home
14	"	"	03/11/2015, 00:37:45, online at her home

Observations

Videos of San Franciso area commutes, self-captured by drivers

Reference number	Driver description		Passenger description	Video description	Video date and duration
1	Lisa	2006 Volvo V50 (station wagon)	none	morning commute, surface streets and freeway	17/09/2015, 17:35, 3:44
2	John	2004 Audi A4 (sedan)	9-year old Mike	morning commute including school drop-off, surface streets and freeway	16/09/2015, 1:44, 1:15, 2:43
3	"	"	none	morning commute, surface streets and freeway	19/09/2015, 2:33, 4:06, 17:35, 13:10
4	"	"	none	morning commute, surface streets and freeway	22/09/2015, 9:35, 15:26
5	Kate	2012 Subaru Impreza (sedan)	3-year old Annie	evening commute including child pick-up, surface streets and freeway	3/10/2015, 15:47, 24:09, 2:05, 21:08

Note: the date, time, and manner of the recordings were done at the discretion of the drivers. Each video reference represents a one-way commute, however it is recorded as a series of clips rather than one long extended videodue to the peculiarities and limitations of each driver's recording equipment (mobile phones, cameras, memory cards, and mounting devices) rather than any conscious editing decision.

In-person driving observations in San Francisco area, conducted by J. Tong (passenger during each observation)

Reference number	Driver description		Passenger description	Observation description	Observation date and duration*
6	Lisa	2006 Volvo V50 (station wagon)	9-year old Mike	morning commute including school drop-off, surface streets and freeway	27/01/2016, 28:58, 24:02
7	John	2004 Audi A4 (sedan)	9-year old Mike	evening commute including school pick-up, surface streets and freeway	27/01/2016, 28:23, 5:23
8	"	"	"	morning commute including school drop-off, surface streets and freeway	28/01/2016, 6:43, 26:14
9	"	"	wife, 48 years/ child, 9 years	Saturday errands, surface streets	23/01/2016, ca. 1 hour
10	Julie	1982 Mercedes-Benz 300D (sedan)	none	errands, surface streets	25/01/26, 00:14:48
11	"	"	child, 5 years	school pick-up, surface streets	25/01/26, ca. 15 min
12	"	"	child, 11 years	school pick-up, surface streets	25/01/26, ca. 20 min
13	Kevin	2001 Honda Odyseey (minivan)	none	errands, surface streets	29/01/2016, ca. 20 min
13	*not applicable*			morning curbside drop-off of students at elementary school	29/01/2016, ca. 25 min
14	*not applicable*			aftermoon curbside pick-up of students at elementary school	29/01/2016, ca. 40 min

*For longer observations, I requested permission to video record. For shorter observations and in situations when recording was not permitted, I relied on taking field notes.