THE CAR AS A SMART ENVIRONMENT

ON THE MYTHS, DREAMS AND DESIRES OF THE CONNECTED CAR

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CONTENTS

LIST OF FIGURES

INTRODUCTION

"So connected you're free". This is the catchphrase BMW uses to introduce their ConnectedDrive suite. It is the name for their collection of in-car apps, services and assistance systems they offer to "help the driver fulfil his needs on the go, be it a travel guide, entertainer or guardian angel". While Internet connectivity is a relatively new development in the automotive industry the current hype surrounding the connected car means it is steadily becoming a 'mainstream' feature for even low-end cars. Manufacturers who are getting their cars ready for the digital highway enthusiastically use popular new media rhetoric proclaiming enhanced freedom for the driver while tapping into — and making use of — the general sense of progress held by the mass public. At the same time they are marketing their products by conveying the generally perceived image of new media as a problem solver, in this case to combat issues such as driver boredom. As BMW's catchphrase implies these embedded new media systems enable us to fulfil long held dreams and desires of making the car more than just a car.

The field of New Media Studies has seen extensive research on utopian myths in regard to the problem solving power of new media and its capacity to deliver its users a sense of freedom. In his book *Tantalisingly Close* (2012) Imar de Vries, Assistant Professor of New Media and Digital Culture at Utrecht University, explores communication desires in discourses of mobile wireless media. He shows us that "technologies of freedom such as the Internet and mobile telephones aim to establish pluralism of expression rather than a dissemination of prefabricated ideas" (Katz qtd. in De Vries: 156). According to De Vries the dreams and desires that accompany our beliefs of constantly improving communication technologies "continuously clash with the reality of everyday communication" (156). By having communication technology at our fingertips virtually every time and place of the day we cannot say it only delivers us with a greater sense of freedom. As De Vries states, "what is one person's serenity or freedom is another person's nightmare or enslavement" (51). When looking at the underlying structure of most modern communication media it is clear that the Internet serves as its backbone. This network enables us to access media from virtually any place, for instance via our cars. Alexander Galloway, Associate Professor in the Department of Media, Culture, and Communication at New York University researched the founding principle of the Internet to examine if it is a controlling or freedom enhancing development. He found that "the exact opposite of freedom, that is control, has been the outcome of the last forty years of developments in networked communications. The founding principle of the net is control, not freedom" (195).[1] Looking at the way car manufacturers introduce in-car media — and connected cars in general — it becomes apparent that while they use phrasing and paradoxes similar to those found in the field of Media Studies they disregard or fail to see potential downsides of their technologies.

The goal of this thesis is to unmask the single-sided media rhetoric seen in automotive discourse by researching how this rhetoric influences our notion of human technology relationships, by showing how the automotive industry has tapped into — and extensively makes use of — the topoi of freedom and control we recognise from the introduction of the Internet. This leads to the following main research question of this thesis: How is popular media rhetoric appropriated by the car industry to present the car as a smart environment? To be able to satisfactorily answer this question we first have to examine key aspects of smart environments, human technology interactions and (technological) myths appropriated by the car industry.

In order to do so I will answer the following subquestions, which will be discussed in detail later on. The first question I will answer from a historical viewpoint is what developments led to the ideation of the car as a smart environment? Subsequently I will answer the question how new technologies find a place in an existing technological environment. Thereafter I will answer the question how in-car systems and the presentation thereof have evolved over time and have tried to transform the car into a smart(er) environment. Here I will zoom in on how notions of control and freedom that arise in smart environments are influenced by (technological) decisions made in the car industry and what the subsequent consequences of those decisions might be.

Lastly and throughout this thesis where relevant I will show and discuss myths appropriated by the car industry such as the teleological projection of progress and the promise of in-car media as freedom enhancing technologies. Stretching De Vries' argument on freedom one might say that driver A could see these advertised new media applications as tools to gain more freedom whilst driver B might see them as tools of constraint and control, as put forth by Galloway. I will show that myths are not lifeless constructs but they actively create their own reality as they do not only display a utopian state, but by the very display of that utopian state or future compel people and companies to act and make that utopian future a reality. It will become apparent that in the strive to materialise these myths conflicts of interest can appear as myths usually support one particular interest or point of view. The United States Government Accountability

1 In order for the Internet to become as universal as it is today highly homogenised protocols like HTML and bureaucratic institutions like ICANN need to be in place, enforcing a mode of control rather than freedom.

Office has for instance shown that manufacturers track vehicle usage trough on-board technologies and pass this information on to third parties (In-Car Location Based Services 2013). This dichotomy between freedom and control is a paradoxical development that raises the question what it means to be 'so connected we're free'?

THE MYTH OF FREEDOM ENHANCING TECHNOLOGIES

In order to answer these questions we also have to look at the interactions between humans and technology in relation to the car. Today popular media and car manufacturers alike present connectivity of cars as futuristic, but as early as 1939, at the New York World's Fair, car manufacturer General Motors (GM) presented their future outlook called *Futurama,* which displayed a form of interconnectedness between the car and its surroundings. The pavilion featured an exposition envisioned by Norman Bel Geddes that showed their view of the road network in 1960 with accompanying visions of driverless cars to show "a greater and better world of tomorrow that we are building today".[2] Then, several decades later during the 1964 World's Fair, *Futurama II* was presented which focused on "vehicles electronically paced, [that] travel routes remarkably safe, swift and efficient".[3] The long held dichotomy between driver freedom on the one hand and control on the other becomes apparent especially in Futurama II where the automated highways meant people were being controlled thus relinquishing freedom. However, in the view of GM — which reads similar to BMW's catchphrase today — they actually gained freedom by relinquishing control.

Currently companies with little to no automotive experience like technology giant Google are experimenting with connected and driverless cars. According to their lead engineer they are doing so in order to help drivers regain the time they waste on their daily commute, quite similar to the argument made by GM several decades earlier and other manufacturers today (Thrun 2010).

While companies such as BMW or Google like to suggest that their "freedom enhancing" technologies are inventions of recent years in actual fact we have been shown an image of — and companies have strived to create a desire for — the connected and driverless cars for at least seven decades. It is however common practise for corporate histories to downplay earlier inventions in order to create a need for their newer inventions. But this raises the question, is the car after

2 Jeff Quitney. "Futurama 1939 New York World's Fair "To New Horizons" 1940 General Motors 23min." YouTube. YouTube, 7 Aug. 2012. Web. 5 Dec 2012. <https://www.youtube.com/watch?v=1cRoaPLvQxo>.

3 Read more about, and listen to the recording of, General Motors' Futurama II exposition on the World Fair of 1964 at: "Welcome to Futurama II." New Yorks World Fair 1964/1965, n.d. Web. 23 Dec. 2012. <http://www.nywf64.com/gm05.html>.

all these decades really turning into a smart environment or is it just another iteration of what essentially is a long lasting dream?

THE COALESCENCE OF SOCIAL AND TECHNOLOGICAL CONSTRUCTIONS

In order to investigate how the dichotomy between freedom and control is structured and to be able to answer our research questions we thus have to investigate both human and technological factors. Two academics that help us to understand the interconnectedness between humans and technology and subsequent implications on freedom and control are Brian Winston and Peter Paul Verbeek. Brian Winston, former head of the faculty of Media and Cultural Studies at the University of Westminster, researched processes of change in technologies of communication ranging from the telegraph to the web in his book *Media Technology and Society* (1998). He focuses in particular on the social construction of technology in order to show a historical pattern of change and developments in communication as a field — which he calls the social sphere — in which science and technology intersect (3). While this approach is useful to map the field of social change, it disregards the potential influence that technology in itself exerts on the development of communications or and humans in general. As shown by De Vries, most scholars distinguish between technological determinism on the one hand and social constructivism on the other when researching technological developments and social change (89). Although both positions belong to the field of science and technology studies, they are widely regarded as the two most extreme positions in this field (Foltz 2006; Hanseth and Monteiro 1998). I therefore propose not to counter Winston with a position of technological determinism, as it will not help us gain a deeper understanding of the question at hand. Rather I will build on Winston's insights and argue that the role technology in itself plays must not be disregarded, as it plays a vital part in understanding how an individual might be controlled or set free by technology. I propose however to complement Winstons model with Actor-Network Theory, as I will argue in the next section that it will gives us a more complete understanding of both humand and technological actors.

In his book *Grens van de Mens* (2011) Peter Paul Verbeek, Professor of Philosophy of Technology at the University of Twente, researches the boundaries between humans and technology and asserts that the human being is in fact a technical being using technology to steer his own evolution (2011: 27). Instead of society playing a determining role in the way we produce and use technology, the development of communication technologies is an interplay between the social and the technological as both technological determinism and social constructivism insufficiently take the agency of either the social or the technological into account (ibid.: 26). Actor-Network Theory (ANT) (Latour 1987; Callon 1986; Law 1987) seeks to combine these two positions by acknowledging that both technology and humans have agency, meaning an entity that is made to act by many others (Latour 2005: 46). In order to fill the gap I will borrow terminology from this theory and use it as a looking glass to reveal the ways in which in-car media technology has agency. To complement the position of Latour and others I will also introduce Philosopher of Science and Technology Don Ihde, by focussing on his work *Technology and the Lifeworld* (1990). Ihde's work is closely related to those of ANT scholars as both argue that things can play an active role in their contexts (Verbeek 2005.: 116). By taking his phenomenological approach into account it enables me not only to see the actions that are taking place in the network, but also sheds light on the structure of how humans experience technology.

METHODOLOGY AND CHAPTER OVERVIEW

In order to confirm my initial beliefs that the subject at hand was worth researching from both an academical and internship viewpoint I travelled to Geneva to attend the 2012 International Motor Show. While talking to representatives and appraising the visuals on the stands of several big name brands — among them Audi, BMW and Toyota — I experienced first-hand the conviction in the myths and dreams of in-car media held by these employees, thus reinforcing my initial belief that this niche of automotive discourse was well worth researching from a media archaeological perspective, the workings of which I will introduce on the forthcoming section using the work of leading media archeologists Jussi Parikka and Erkki Huhtamo. Having experienced these convictions in myths and dreams of the car industry combined with my personal interest in media and the car industry, I decided to persue this research topic. My research and subsequent thesis is split into two phases which are both grounded in media archaeology. The first phase of this thesis consists of archeological research conducted during my internship at the Netherlands Organisation for Applied Scientific Research (TNO). The second part consists of a discourse analysis of the statements and media text unearthed in the first phase. I will explain these phases in more detail shortly but first I will hone in on the workings of the overarching discipline used in this thesis, namely media archeology.

In their leading edited volume *Media Archaeology: Approaches, Applications, and Implications* (2011) Jussi Parikka and Erkki Huhtamo give an oversight of the status quo of the field of media archaeology, which focuses on excavating non-linear histories of media embedded in discursive fabrics and patterns in a culture (Huhtamo 1997.: 221). By unearthing traces of media historical narratives I can show how statements are constructed and have an ideogically determined nature (Huhtamo 2011.: 29). Huhtamo's personal contribution to the book is especially important as his understanding of topos is of great value when interpreting the information that I have unearthed in the research phase. According to Huhtamo a topos "is a stereotypical formula evoked over and over again in different guises and for varying purposes" (Huhtamo 2011.: 28). For example, advertisements of internet communication services will often adhere to a strict formula with set boundaries — cultural or physical — that are being broken down by the technology which in turn presents a general image that a better world of tomorrow with its endless possibilities starts today. I will show that car manufacturers adhere to a similar formula when it comes down to displaying the futuristic capabilities of their products such as infotainment- and connectivity systems. By attributing agency to artefacts media archaeology breaks away from social constructivism and touches upon the field of actor-network theory, which as previously discussed I will use as a lens throughout this thesis by borrowing its terminology as it will help distinguish human and technological actors. Aditionally, this decision is grounded in the fact that there is yet no general agreement about terminology or principles of media archaeology, as it is still an emerging field and not (yet) a clearly demarcated discipline (Huhtamo and Parikka 2; Kluitenberg 51).

For this research I refer to David Deacon, Michael Pickering, Peter Golding and Graham Murdock who wrote the extensive work *Researching Communications, A Practical Guide to Methods in Media and Cultural Analysis* (2010). The authors argue that media texts are not merely conveying information but tend, more often than not, to mobilise or reinforce relations of control, thus they cannot be seen as neutral (154). Hence the uncovering of media texts in regard to the car as a smart environment will enable me to gain insights in how the automotive industry applies new media discourses and uses its topoi in the second phase of my research. Deacon et al. learn us that the most important aspect of this research is obtaining relevant primary and supplementary sources (15). To do so I have collected statements from an array sources ranging from printed materials to informal interviews, which combined form a corpus that, I believe, enable me to produce a comprehensive overview of the status quo in the automotive industry and will provide answers to my research questions.

First I have delved in the physical archives of the The Royal Dutch Touring Club (ANWB) in The Hague and the Dutch Centre For Historical Car Documentation (NCAD) in Helmond, which are two of the most complete auto-historical archives in The Netherlands. In researching these archives I intend to unearth both textual and visual topos in order to show how these stereotypical formula have been recycled by the car industry in their advertisements throughout the decades. As this would mean reviewing nearly eight decades worth of magazines in the case of the ANWB archive alone — the first issue of its Auto Kampioen magazine was published in 1930 — meant that the sheer volume of these non-digitised archives forced me to opt for the sampling of data. Following the advice of Deacon et al. on data-sampling (122) and in line with my desire to paint a broad picture of the automotive field I have thus limited my research by starting with the earliest documents available from 1930 and opted for systematic sampling by working my way up in five year intervals (48). In the archives I was looking for two sorts of media text, the first being advertisements, both placed by the car industry itself of suppliers of automotive parts. The second type of text that I looked for were articles written on in-car technology. In the case of the ANWB archive these would be written for popular media and in the NCAD archive would have a technological explanatory focus. The combination of these two types of inscriptions will enable me to gain insights in which rhetoric is used to talk about car development, as they contain both primary (carmaker) and secondary (popular media) sources. An critique on this approach however, as I will manually sample the archives, can be my bias towards for me important developments, meaning that I would be steering my research a-priori towards well-known events and was at risk of missing out on developments of which I had no knowledge, such as inventions that seemed feasible at the time but met an untimely demise at the face of competing inventions (Huhtamo and Parikka 3). As these failed inventions are less known it would be easy to miss them when searching for popular inventions. By also going through random samples of volumes in which I did not expect to find substantial data I have minimised this drawback. At the NCAD the archive was categorised as it consisted of journals, books and magazines. Contrary to the ANWB archive the NCAD archive inclined towards the technical side of the automobile such as trip computers, in-car entertainment components and instrumentation displays. While being invaluable for researching the technological side of the automobile it was less so in regard to amassing automotive advertisements. As such, the information gained from the NCAD research proved to more of use in the technological explorations in this thesis.

During my internship I not only did archive research as said earlier, but I chose to incorporate other sources to further support my research. I chose to expand my sampling frame with other sources as Deacon et al. learn us that one may need to construct his own sampling frame as a single source or archive may not be comprehensive (47). London Business Conferences was kind enough to let me attend their Connected In-Vehicle Infotainment Summit in 2012 in exchange for providing them with an extra set of hands were needed. During this two day summit I conducted non-scripted interviews with decisionmakers and suppliers of car manufacturers. During these two days I also attended all 22 talks of industry experts. The information gathered during this event is mainly used in the last chapter where I map technological change in the car industry. Another source of research during my internship was the database of the European Patent Office, to see which companies had filed for patents or intellectual property regarding workload managers. These workload managers — digital gatekeepers that control the flow of information to the driver — are seen as a solution in the car industry to combat driver distraction, mapping them gives an insight into which companies could be viewed as industry leaders. Ironically workload managers are a solution to a problem that is partly created by the car industry itself. I will discuss this develoment in the last chapter where I talk about freedom and control in the car. The fourth source of my archaeological research was an interview with Dutch Mobility Historian Gijs Mom, whom kindly agreed to share his thoughts on important developments in car history, and provided invaluable knowledge in my search for parallels of media developments in current and older cars, which benefitted the historical viewpoints found in this thesis.

The second part of this thesis consists of a historical discourse analysis of the statements I have collected during my internship which stretch from the advent of the car to current times, and help uncover possible cross-references that would otherwise remain hidden from sight. For this historical discourse analysis I yet again use the work of Deacon et al. in combination with that of Huhtamo and Parikka. By using discourse analysis I will show where the car industry uses statements that are not merely conveying information about a product, but are borrowing semiotics and topoi known from the media industry. I will argue and show that these statements and subsequent products are actively shaping the way we percieve them and mobilise or reinforce relations of control of companies over society (Deacon et al. 154). Reflecting on the research method in these archives one can say on a critical note that discourse analysis hangs on the interpretation and choice of sampling made by the researcher and therefore does not provide 'hard' answers. And moreover, as Martin Barker, Professor of Film and Television Studies at the University of Wales argues, "discursive methods always suffer from the difficulty that they are harder for other analysts to check" (165). However, it is my belief that by acknowledging the limitations of my samples as Deacon et al. call for, and describing my research decisions to the fullest, discourse analysis helps gain valuable insights into the field of automotive that would otherwise remain hidden.

As the information as discussed above is dispersed troughout the chapters of this thesis I will briefly introduce the steps I will take in each chapter. In the first chapter I will follow Winston's lead and take a media historical perspective to explore moments in the development and implementation of new media into the car (Winston 1998, Huhtamo and Parikka 2011, De Vries 2012). In this chapter I will answer the question what developments led to the ideation of the car as a smart environment which will inform us since when the car industry has talked about forming smart environments. By using historical information gathered from the ANWB and the NCAD archives, and combining this with current automotive advertisements gathered during my internship, I will show how car infotainment has developed from a build-in radio towards current driver assistant systems brought to life by a drive towards miniaturisation of technology. This historical information is used to form a case study to show how the topos of the information revolution is claimed by car manufacturers. I will show they have resulted in similar utopian advertisements we know from the information revolution, displaying the myth of linear technological progress and a false notion of freedom. It will become apparent that car advertisements have changed from depicting the ultimate freedom machine towards advertisements which focus on the car as a medium where freedom is depicted as a result of embedded digital technologies.

The second chapter is focussed on exploring technological and human elements that constitute smart environments. In this chapter I will show that miniaturisation and the subsequent increased pervasiveness of technology in our everyday lives has changed our perception of what is human and what is technological. In order to answer the question how the car industry is appropriating popular media rhetorics to present the car as a smart environment it is imperative to understand how a smart environment is formed and how the car industry is positioned in the human versus technology debate. In this and the subsequent chapter I will show how the belief of the car industry in technological myths dictates the direction of their research and development efforts and simultaneously is shaping the way in which the car is presented as a medium in advertisements today. To do so I will first explore in this chapter how a new technology finds a place in a existing technological environment by introducing Brian Winstons model of technological change. This model sees technology as standing in a structural relationship to science, being brought together in the social sphere (Winston 4). Combining this model with an media archeology and social constructivist perspective, supplemented with terminology provided by actor-network theory provides a sound basis to see how a new technology is formed by both human and technological actors. This approach enables me to track technological change of in-car technology and will make it evident that early processes like the miniaturisation of technology have been important developments in the facilitation of in-car media we know today. By exploring the formation of smart environments and persuasive technology this chapter lays the basis for our exploration of the car as a smart environment in the subsequent chapter.

In the third chapter, using discourse analysis (Deacon et. al. 2007), I will build upon Winston's model as set out in the previous chapter and, combined with the ANT looking glass and structure on human technology relations provided by Don Ihde, use it as a hanger to show how technological change takes place within the car industry. To fully explore in what ways the automobile is being constituted as a smart environment it is of importance not only to focus on its being in the world but also to take its inception into account. This will make it clear how myths are an integral part of the car industry in not only presenting the public with a progressive image in advertisements, but that these myths in fact steer technological developments as the car industry tries to materialise the utopian future they created in their advertisements. It will become apparent that the myths that are appropriated by the car industry find their origin in the information revolution. According to Winston, the concept of the information revolution is "largely an illusion, a rhetorical gambit and an expression of technological ignorance" (Winston 2). Following Winstons lead I will show that the illusions that accompany the myth of the information revolution have trickled down in the myths seen in the car industry. I will show this by using the information gathered during my internship at the International Motor Show, the Connected In-Vehicle Infotainment Summit and patent- and desk research which will form the core of this chapter. It simultaneously allows me to show the status quo of technological change in the car industry which will form the basis of my exploration that aims to reveal how in-car systems — and the presentation thereof — have evolved over time and have tried to transform the car into a smart(er) environment. Here I will build upon the human technology relations as discussed in the previous chapter and show how the car can be seen as a mediator in human technology relations. This mediating power becomes especially clear in the future outlook where I introduce the bring your own device and location based information trend. I will show how these developments reinforce the paradox between freedom and control in the car and what possible consequences and concerns arise from these trends in the field of ethics, privacy and law when keeping in mind increased interwovenness of humans and technology in smart environments. This puts catchphrases like BMW's 'so connected you're free' into a position where we can clearly see how popular media rhetorics is appropriated by the car industry in their quest to make the car a smart environment.

"CARS ARE ABOVE ALL MACHINES THAT MOVE PEOPLE, BUT THEY DO SO IN MANY SENSES OF THE WORD" (MIMI SHELLER 2004.: 221)

1 THE HISTORY OF CAR INFOTAINMENT

With the press of a button the autopilot takes over and your car weaves itself at a steady pace through traffic in downtown San Francisco. The state of California, after permitting car manufacturers to test their driverless vehicles on public roads — which has been a great success — has passed legislation that enables drivers to take their hands of the wheel and sit back and relax whilst being chauffeured to their destination. Suddenly a text message pops up on the augmented reality windscreen: a friend asks if you will join him in a bar across town. After accepting the coordinates your friend sends to the car, it sets off for a scenic route in the direction of the bar. Upon encountering the Golden Gate Bridge the car highlights the structure on its augmented reality screen and provides the inhabitants with facts and figures about this well-known landmark. A bit further down the road you decide to see if some of your other friends are in the bar and launch your on-board Facebook application to see if they are checked-in. Two friends are on their way to the bar as well and ask for ride while showing their position to the car. The car reroutes to pick up your friends and a bit later you arrive together at the bar, ready for a big night out.

This story is not just any story. This is Mercedes-Benz' vision of human machine interaction of the car of the future, presented at the Consumer Electronic Show in 2012, called DICE (Dynamic Intuitive Control Experience). In the introductory video Mercedes-Benz asks the viewer the following questions;

> "Do you know someone who can show you the world like you've never seen it before? Do you know someone who helps you maintain contact to your friends? Do you know someone who shares and supports your interests? Do you know someone who shows you the correct, most convenient and safest routes? Could that 'someone' be your car?"
> *(Mercedes-Benz DICE video 2012)*

Apart from seeing the car as a tool to get you from *A* to *B* Mercedes sees the car also as a medium. In their holistic interface the driving task is not necessarily the primary task of the cars' inhabitants, besides being a (small) part of the physical road system the car becomes a bit on the digital road system as well. As shown in the story above Mercedes-Benz views the driver of the future becoming more of a passenger, with cars that are always connected, using gesture control and augmented reality in order to integrate the outside world into the driving experience. According to the manufacturer *series* production will only be 'a matter of time' before your car becomes a 'someone' that assists you in not only exploring the physical world but the digital world at the same time. But how does this so called futuristic vision compare to others when looking back at the history of in-vehicle infotainment? Is it yet another myth using new media discourses or are we really at the forefront of a new digital car age?

In this chapter I will investigate the myths and dreams of infotainment from a historical perspective by first looking at one of the oldest infotainment devices, the car radio. I will gradually work my way up from analog towards digital systems which have sped up the ideation of the car as a smart environment even more. It will become apparent that the miniaturisation of technology has enabled car manufacturers to go from cars with radio as the sole entertainment, towards a highly computerised vehicle in which Martin Geier, who has researched automotive software architecture, supposes that "most innovations . . . take place in their electronics and software" (n. pag.). These developments, as I will show, offer endless possibilities and subsequent freedom according to car manufacturers. By first taking a historical viewpoint we can see that the discourse of the car as smart environment has in fact been around before digital technologies were introduced. It also shows how the car industry has appropriated myths that predate the digital realm, for instance in their visions on the electric super highway. Furthermore it will become apparent that the car as a system can never deliver on its promises of the 'ultimate do-everything car' as the utopian futures whereto car manufacturers point keep on shifting with the introduction of new technologies. I will demonstrate that this is clearly visible with the introduction of the the microprocessor in vehicles that bought with it the myths and beliefs of digital technology's problem solving powers to the car industry.

1.1 CONCEPTS OF TIME AND PROGRESS

Before investigating the myths and dreams of vehicle infotainment another overarching myth that relates to all aspects of this thesis should be addressed first. This myth is the myth of linear technological progress and development. De Vries investigated discourses of progress and found that there are three basic concepts of time; the linear, cyclical and spiral view, the first of which being the most dominant paradigm (36). In order to substantiate my claim that there is a repetative element visible in the way that the car industry talks about car improvement it is important to discuss different concepts of time and progress beforehand. It will become apparent that the car industry, in their strive to present the public with the 'greatest and latest', opts for a linear concept of time and progress meaning each step taken by the manufacturer will take us closer to the utopian future they set out to materialise. According to De Vries this idea of "progressive linearity denies degeneration, evades the idea of going back, and tries to hold an equilibrium while continuously elevating it. There are, of course, various periods of short-term ups and downs that become visible when one zooms in on a small scale, but ultimately, and on a larger scale, the net result projected by the linear perspective is advancement" (36). Thus, in order to truly see how the history of the car as a smart environment has developed we should acknowledge that opting for a dominant linear perspective severely limits our understanding of car improvement and subsequent technological change. Rather, I will side with De Vries and acknowledge that opting for a spiral view as opposed to a linear view of time will better help us understand the way in which technological developments and advancements take place. It is only when viewing technological developments from a spiral perspective that we can uncover dreams and myths of technologies from days gone by, without disregarding progress. De Vries is not alone in his plea to analyse progress in a non-linear fashion as independent media theorist Eric Kluitenberg, whose article was published in Huhtamo and Parikka's seminal work, shows in his archeological analysis of imaginary media by citing sci-fi writer Bruce Sterling: "The notion of continuous progress from lower to higher, from simple to complex, must be abandoned, together with all the images, metaphors, and iconography that have been—and still are—used to describe progress" (Kluitenberg 51).

Yet another reason to opt for a spiral perspective of time is given by renowned French sociologist Patrice Flichy, who has extensively researched technological innovation. In his book *Understanding Technological Innovation* (2007) he contends that to disregard the existence of technological choice — which as shown is at the core of the linear perspective — and saying that "the most effective technique always prevails means either disregarding the complexity of the development process of a technology or having a tautological reasoning where the right technology is always the one that prevails" (Flichy 17). In supporting Flichy's remark, Media Archeologists Huhtamo and Parikka rightly argue that "dead ends, losers, and inventions that never made it into a material product have important stories to tell" (2). In order to combat the prevailing linear perspective of time and to be able to show technological progress to the fullest the spiral perspective of time will thus be the primary view in this thesis. By this I mean two things. The first is that I did not let the linear perspective drive my archeological research that is the foundation of this chapter, as this would have resulted in a text where the concept of lineair progress would form the backbone rather than the subject of study. The second point is that when discussing technology troughout this thesis I will do so from a spiral perspective of time where the subjects of study in this thesis are mostly presented by their manufacturers as lineair developments. Opting for the spiral perspective as the main way to frame (technological) developments enables me to make visible where the lineair perspective comes into play and how it tries to re-frame history. This will greatly enhance our understanding of technological change and makes visible which recurring myths are being appropriated by the car industry to market their cars as smart environments.

1.2 DEFINING INFOTAINMENT SYSTEMS

When researching the field of automotive history it becomes apparent that multiple terms are used to describe the implementation of (new) media in the car such as infotainment, in-car entertainment or in-vehicle infotainment. Two scientists with a focus on telecommunications and vehicle dynamics, Raphael Jung and Hans-Peter Willumeit, give the most usable definition of what these systems entail in their paper *Objective Evaluation of the Complexity of Usage for Car Infotainment Systems* (2000). According to them an infotainment system is the combination of electronic systems in a car which are not directly related to the driving task, such as entertainment in the form of radio and CD player, information in the form of the dashboard computer and driver assistant systems such as navigation.[1] While this definition provides a good starting point in defining infotainment systems, it needs to be revised and expanded in regards to driver assistant systems to accommodate for the stretched meaning of this term in more recent years. Apart from seeing navigation as a driver assist system, the term is also used to indicate automated systems that help the driver with the driving task whilst not needing conscious driver input (Marchau et al. 2001; Leen and Heffernan 2002). I therefore argue, contrary to Jung and Willumeit, that the term driver assist systems need to be stretched to incorporate systems that are related to the driving task, as they are at the core of manufacturers' efforts in making cars 'smart'. However, while these systems — such as automated parking assistants or radar guided cruise control — do in fact relate directly to the driving task, they only act when it 'feels' the driver fails to do so.[2] As Jung and Willumeit themselves point out, many in-car functions have been integrated into one single system (369). I therefore see them as part of the ecosystem we define as an infotain-

1 As aforementioned the distinctions between these systems are not as clear as posed here. In the real world GPS could be seen as entertainment (points of interest), information (situational awareness) or driver assist system (route guidance and anticipation). The division made in this definition will however help me in deconstructing the car-systems talked about in this thesis.

2 With these systems I mean advanced driver assistance features like lane keeping, automatic breaking, radar guided cruise control, automated parking but also GPS navigation features.

ment system in that it affords the driver a certain sense of freedom to operate other on-board features such as the infotainment system.

Two other terms will also need reflection before we can delve into the history of infotainment systems; the adjective *in* and the word *system*. The adjective in is a much-used addition to the category of infotainment systems. The word is used in the form of *in-car* or *in-vehicle* to show that a certain process is ongoing within the confines of the metal or composite tin we call a car. By connecting this tin to the Internet we have to recognise that it becomes part of a bigger network and, being a part of this network, it essentially becomes an interconnected node as sociologist Manuel Castells describes (2001.: 1). To say that a car is connected to the Internet is consequentially to say that the Internet is connected to the car. While looking at the capabilities of the navigation system that forms a part of BMW's ConnectedDrive it becomes apparent that the car can receive route information sent to it via a computer, and on arrival can send further route guidance on foot to a mobile device. As a result, I will henceforth deliberately withhold from using the adjective *in* — such as in-vehicle or in-car — as it is in fact contradictory to the connected nature of media systems as they also operate outside of the physical confines of the car. The word *system* is a construct that appears with the help of an actor-network theory lens. By using the word *system* in infotainment system it must be clear to the reader that the term is in fact a container, commonly referred to as a black box, which hides the fact that it is actually an assembly made of many parts both human and technological. When required I will open these so called black boxes in order to reveal the composition and subsequent implications of the infotainment system in question.

I will use the three sub-categories of the infotainment system as defined by Jung and Willumeit — entertainment, information, and driver assistant systems — as a hanger to chronologically explore the history of in-vehicle infotainment and explore the technological dream, or rather the desire, of having technology as a passenger in the car throughout several decades.

Firstly, I will talk about the introduction of the car radio as an early entertainment system and show that the introduction of the car radio raised questions on safety, as the inhabitants would be cocooned in an auditory space. It will become apparent that the same arguments used at the time of the introduction of the radio in the car are still used today in the promotion of newer infotainment systems. I will show this by introducing an early car radio advertisement from manufacturer Philips geared towards the Dutch market that shows how a safety topoi was deployed to help sell the product.

Secondly, I will address the development of more sophisticated and digital information systems with a special focus on the eco-meter found in cars from the eighties onwards and briefly reflect on how these systems can be seen as having a controlling power over the driver. Before doing so, it is necessary to delve into the history of a new vital component of these information systems that will also play a vital role in the driver assistant functions; the microprocessor. As said earlier, most innovations take place in their electronics and software, which are in fact powered by microprocessors. By concisely investigating the birth of the microprocessors we can how the computer industry looked at the development that would eventually power most of the devices we use every day, including our cars.

Thirdly and lastly, I will talk about driver assistant functions that, like information systems, rely heavily on the microprocessor. I will begin in the mid-eighties with GPS in cars, advancing through the years to current views on automated 'smart' systems that help drive some of today's modern cars. I will do this by reflecting on the future outlook of Mercedes-Benz's Dynamic and Intuitive Control Experience and current advertisements of BMW's ConnectedDrive suite to show the topos of safety, as seen with the introduction of the car radio, and the topos of freedom that as previously mentioned, can be seen in a variety of internet communication services, is a recurring element in the rhetoric carmanufacturers use to promote their automobiles.

1.3 THE CAR RADIO AS EARLY ENTERTAINMENT SYSTEM

With the advent of the 'modern day car' in 1886 by Karl Benz, individuals acquired a means of personal mechanised transportation to be used whenever they wanted, as opposed to previous forms of mechanised transport like the train (Geddes 1940.: 40). While at first the car was primarily a machine for wealthy individuals, prices quickly dropped after Henry Ford began building his Model T on a moving assembly line.[3] This drop in pricing, together with increased wages, allowed for the car to come in reach of the middle classes of American society. From 1908 to 1927, when the production was halted, around 15 million Model T's were built (Miller 2001.: 6). With more people being able to buy cars, the focus of manufacturers shifted towards providing more luxury in vehicles.

One of the developments that found its way into the car was the radio. During my research in the archives of the ANWB I found several advertisements hinting that a car without a radio is not a complete car. Karin Bijsterveld, Professor of Science, Technology & Modern Culture at Maastricht University, who was inaugurated on her research of soundscapes of the car, shows us that motorists in the early 1920s would already bring portable battery powered radios along in their cars in order to listen to music. Car manufacturers reacted to this development by providing customers with the option

3 By using this production technique the cost of the car quickly dropped from $825 (for the Runabout model, roughly $17,000 in today's currency) to $260 in 1924.

to fit radios into their cars (Klawitter et al. qtd. in Bijsterveld 193). Fully built-in car radios eventually started appearing from 1928 onwards, with the American Transistone6 as one of the first to market. Soon thereafter consumer electronics companies such as Motorola and Crosley developed car radios for the American market whilst Blaupunkt and Philips focused on the European market (Bijsterveld 193). The development of in-car radios started at a similar time period on both sides of the Atlantic Ocean but the adoption rate between the two continents was a-synchronous. According to Bijsterveld, this a-synchronicity likely arose due to the lack of a dense short-wave broadcasting network in Europe compared to the US (ibid.). When looking at the adoption rate of this new technology some thirty years after its introduction it becomes clear that the superior broadcasting network in the United States facilitated the growth of this new in-car technology. By looking at the adoption percentage this becomes apparent as in 1966 only 17 percent of European cars were equipped with a radio, whilst in the US this rate was almost 95 percent in 1971 (ibid.).

Today the radio is usually part of the standard equipment of a car on both sides of the Atlantic, but it is a little known fact that US lawmakers tried to ban the use of radios in cars as they were found to be distracting. The radio was effectively the first apparatus embedded in the car that required constant auditory attention of the driver when turned on. It should be noted that according to Bijsterveld the introduction of the car's enclosed body in the 1920s did not appear to have an effect on the early advertisements on car radios as they were not exclusively geared towards listening in an enclosed moving car, but mostly showed listening in a parked open car by people outside of the vehicle (193). While not all drivers listened to the radio in the same setting, the mass fitting of radios in the car and the development of closed top cars did however strengthen the cocooning effect of this entertainment system. As a result, the view and focus of the driver of an enclosed automobile changed from an outside perspective towards an inside perspective where the car would become an auditory cocoon. There is a duality in this cocooning as the car shields the inhabitants from ambient noise but at the same time lures in the outside world of manmade noise that comes from the radio broadcasting networks. The way we experience driving has thus been radically transformed with the installation of the radio in the automobile. The 'private' space of the car was now pervaded with radio chatter and music thus changing the dynamics of the car into a sort of cocoon for the driver, where it was previously an adventure machine for exploration that had drivers looking outwards (Mom, Schot, and Staal 2009).

As touched upon earlier, the duality that came with the car radio made lawmakers in the US especially concerned. Soon after its introduction, the car radio was met with skepticism of individuals and governmental agencies alike, who suspected that listening to the car radio deteriorated driving ability and according to Bijsterveld, "various American states considered banning car radios, either within city limits or altogether" (196). The ban on radios was never fully realised due to an effective lobby of the car industry according to Bijsterveld (ibid.). She cites a New York Sun article from 19th of April 1930 (appendix 1) that stated "the White House has no disposition to take part in the controversy, especially in the view of the trade angle involved". Eventually the state of Massachusetts came up with a possible solution to this problem that, as I will show, is still being used in today's systems. The solution of the governing officials was that one was allowed to operate the radio but only when the car was parked, not while driving (Bijsterveld 196). It is clear that a system we now take for granted was actually met with skepticism on the part of governmental organisations and sold on the same myths we know manufacturers use in current times, as will momentarily become apparent.

It is however striking that in 1955 Philips ran an advertisement in The Netherlands that shows the manufacturer actually promoting the safety of having a radio set in the car, whilst they knew full well of the social controversy surrounding cars in the United States (Bijsterveld 196). It is this safety and freedom paradox that repeats itself and also shifts over time, as I will show in the third chapter by discussing safety debates on modern driver assistant systems.

The advertisement as shown in figure 1 is geared towards create a feeling that a car is not complete — or safe even — without a radio. The text at the top of the picture on the next page reads in Dutch: "Do you have everything? You can only say 'yes' if you have a Philips car radio". Philips continues to say that this companion "makes driving more pleasant and safer, by steering you quickly through the tough parts of a trip". It is especially the last sentence that has become prominent in one form or another in regard to infotainment systems. Apparently, the car alone is not sufficient for modern-day drivers. They need to be entertained according to Philips. With traffic jams, speed regulations and foreign technologies like the radio luring people out of their current environments and require constant driver attention, the car has since sped away from its image as ultimate freedom machine (Urry 2004).

I have shown that the implementation of a foreign device as the radio into a car in the latter part of the 1930s caused unrest on a social and governmental level but was also eventually successfully marketed as a safety enhancing technology. I will come back on the topos of safety established here and show how this is still used in newer advertisements later in this thesis. While the topos is similar, these new systems are drastically different to the car radio. Where the car radio was a tool to receive information, the newer systems

Figure 1: Philips car radio advertisement (1955)

can send and receive information. This will be discussed further in the following section where I show how the invention of the microprocessor facilitated two-way flow of information. This is then linked towards systems that are evermore connected between themselves, their drivers and the world around them.

1.4 THE EMERGENCE OF DIGITAL INFORMATION SYSTEMS

When reading the comments on the launch of a new car on a weblog or scrolling through car forums a strong feeling of nostalgia towards older cars emerges. It appears that older cars provoke feelings of reminisce of the days when driving was still a mechanical and analogue activity. Compared to today's cars with computer aided driver assistance systems and information gizmos, these older models supposedly give the driver an exciting and more involving drive. An example is given by an editor of the popular car weblog Jalopnik as he rightly notes that, although the '00 E46 BMW M3 is now seen as one of the last true drivers cars, it in fact "came with so many electronic controls that when Top Gear reviewed the car at its launch, they turned all of their abbreviations into a tongue twister" (Raphael Orlove). On the other side of the spectrum newer cars are given nicknames for their digital information systems by bloggers, with the '07 R35 Nissan GT-R being described a 'PlayStation on wheels' as it can display a wide variety of user customisable information on the big display in its dashboard such as lateral G-forces, boost load and torque diagram (Jesus Diaz).

The question arises: how did we came to the point we are today, where highly digitised cars are dubbed 'PlayStations on wheels' and we talk about older cars as being better to drive plus giving them the analogue label although they too had electronic controls and gizmos? Triumph already tried to monetise this label by running an advertisement back in 1970 saying 'people should drive cars, cars shouldn't drive people' making it problematic to see the analog versus digital debate as a novel discussion (appendix 2). As previously stated I will first explain the conditions that created an environment in which these information systems could be developed, namely the drive towards miniaturisation of technology and the advent of the microprocessor that is the at the core of computational power embedded in cars today.

Brian Winston, Professor at the University of Lincoln, has researched the history of the microprocessor in his book *Media Technology and Society: A History from the Telegraph to the Internet* (2003). In his research he shows that the majority of the computer industry had been blind to the idea of decentralising computing power as it was the era of big powerful computers and subsequently little attention was being given to small computers (Winston 225). As there was much money to be made on big mainframes the computer industry decided the way forward was the development of big mainframes versus focusing their attention towards building smaller computers.[4] Winston points out that "nobody was seriously interested in fully exploiting the device [computers] by making it smaller and cheaper" (227). He continues to say that "all baby machines were strangled at birth or, like the somewhat larger Pilot Ace, never duplicated" (ibid. 227). The focus of big corporations on mainframe-technology consequentially provided smaller companies with the opportunity to take it upon themselves to strive towards the miniaturisation of computer technology. It was these small companies that enabled the development of the microprocessor, in turn allowing car manufacturers to implement computing power into cars as computing power would have to be drastically reduced in size and weight to be appealing to car manufacturers. Companies like the Digital Equipment Corporation (DEC) developed the PDP 8 minicomputer in 1963, a groundbreaking device that paved the way for miniaturisation as it was drastically reduced in size, price and weight in comparison to other computers of that era.10 The PDP 8 was a commercial success and after two years more than 75 compan-

4 They chose to lease their machines instead of selling them, affecting the rate of innovation of the computer industry as a whole: "Since the loyalty of IBM's lessors was already working to limit the ease with which even the largest firms, with even the most advanced products, could enter the market, the entire industry settled early into a certain technological conservatism" (Winston 228).

ies focused on the miniaturisation of computer technology (Winston 230). From this brief historical perspective we can sum up that in the first decades after the Second World War the big computer companies like IBM did not see a business case for producing miniaturised computer parts. It was the grassroots movement from computer enthusiasts and small companies like DEC that eventually led to the miniaturisation of computer technology that could be implemented in other fields such as the automobile. It did however not take long for the bigger companies to realise the potential of miniaturisation and from the late seventies onwards large corporations like IBM and Intel caught on with the early innovators and shifted their focus on producing microcomputers as well (Winston 235).[5]

With an industry relentlessly geared towards producing ever smaller and powerful processors it did not take long for the automotive industry to make use of this product as the first microprocessors were introduced in the car around the 1970s. Today, high-end cars can contain anywhere between 50 and 100 processors that perform a vast array of tasks (Geier et al. n. pag.). One of the uses of these processors is to collect, interpret and present information about the current status of the car to the driver. For now I shall focus on the information gathering and analysis aspect of these processors and I will reflect on the other uses of these processors in the following chapters. A type of information that is prominently displayed in most modern cars is the current fuel consumption. While economy meters have been around for quite a long time — I vividly remember that as a boy I would often see an orange LED jumping to life every time my dad accelerated onto the highway to indicate excessive fuel use — they are relatively dumb in the sense they do not interpret the information on a deeper scale. In my dad's case the LED would light up if you pressed hard on the accelerator pedal. Nowadays fuel consumption meters are mostly standard and, more recently, also give advice on driving in a more economical fashion, for example, indicating when it's advisable to shift to a higher gear in manual cars in order to reduce consumption. Another recent development is the use of the car as a node that collects and interprets driving data. Modern cars are controlled by complex computer systems that use tens of heterogeneous processors which offer rich connectivity (Checkoway et al. 2011).[6] By tapping into the data streams created by these processors a manufacturer is able to track and subsequently analyse the inputs the driver makes. Based on these inputs the car can teach the driver to be more econom-

5 A former IBM employee founded DEC in 1957, The PDP8 minicomputer weighed 150kg at a cost of $18,000. Source: Jones, Douglas W. "The Digital Equipment Corporation PDP-8." Homepage Douglas W. Jones. University of Iowa, 27 Aug. 2013, Web. 19 Nov. 2013. <http://homepage.cs.uiowa.edu/~jones/pdp8/models/>.

6 While researching the implications of interconnected systems in the car from a security perspective, Checkoway et al. found they were able to compromise the safety of the car by hacking various systems.

ical, thus turning driving into a serious game to reduce Co2 — as the Fiat eco:Drive online community shows.[7]

The question arises what this stream of information does to the driver. Does more information about our car and surroundings make us a better and more capable driver? It appears that the car industry has appropriated popular media rhetoric, yet again borrowing from the myths seen in the information revolution which is classified as rhetorical gambit by Brian Winston (2), by saying that more information will lead to a better informed public which ultimately equals to more freedom. These questions will be answered in chapters 2 and 3 in detail, but in order to give some insights on what to expect I will briefly refer to the work of Peter Paul Verbeek, professor of Philosophy of Technology. He says that while pervasive systems like these do indeed enhance driver awareness in an economical sense, they also "may give users the impression that they are acting in an environmentally-friendly manner by driving like this, whereas the bicycle or train would be a better option from the environmental point of view" (2009.: 240). By looking at these developments through the eyes of Verbeek it can be said that these systems actually make people search for economical or environmental gains within the confines of the car instead of elsewhere. Thus the focus of the driver again is turned towards his actions inside the vehicle instead of opting for a broader view to view the car as just one of the possibilities in a much broader transport ecosystem. From the turn of the century onwards more persuasive technology and ambient intelligent systems like the relatively low-tech eco meters have found their way into cars, usually in the form of driver assistant systems.

1.5 THE RISE OF SMART DRIVER ASSISTANT SYSTEMS

As showed in this chapter the systems embedded in a car have the power to alter or shift the awareness of the driver towards his surroundings, such as in the case of the radio, or to shift the perception of one's behaviour towards an environmental and economical perspective. Over time these systems have come together to form an ecosystem that has created space for further systems to emerge, as I will show in the third chapter.

A much used driver assistant system today is the navigation unit. This tool that helps you find your way and promises that you will never be lost again also plays a big role in how drivers perceive their surroundings. As could be seen in the example of the radio that keeps you company on long trips, the navigation system is your personal

7 In 2010 Fiat has released an report on savings made possible by eco:Drive by analysing 428,000 journeys made by 5,697 drivers in 5 countries over 150 days. Source: "Ecodriving Uncovered." ecoDriver. European Comission 7th Framework Programme, n.d. Web. 12 Mar. 2012. <http://www.ecodriver-project.eu/library/other-documents/ecodriving-uncovered/>.

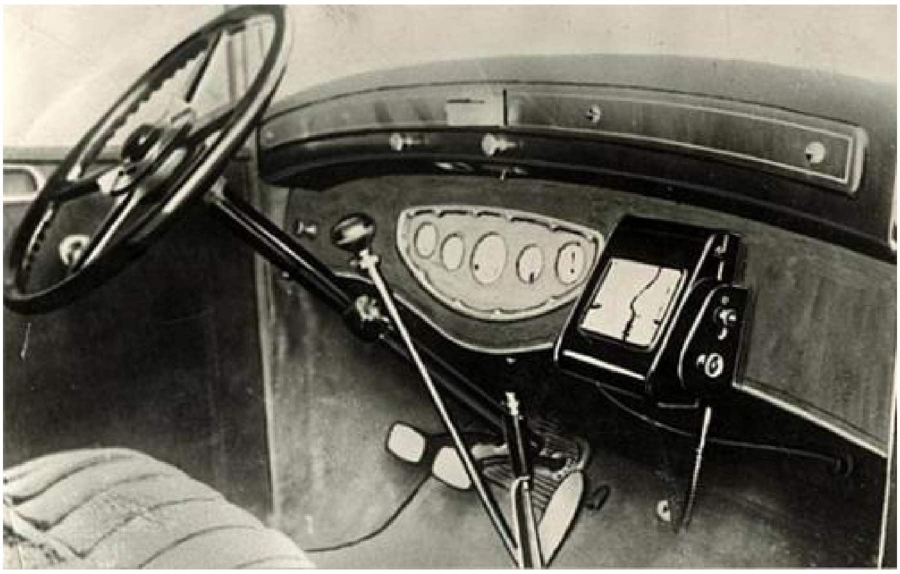

Figure 2: The Iter Auto navigation system (around 1930)

guide that shows you the quickest way to get from A to B.[8] The notion that these systems play a big role in how a driver interprets his surroundings is exemplified by the unfortunate stories that everyone has heard at least once, about people driving to the wrong destination by choosing the correct town in the wrong country, taking wrong exits or driving into hedges because these systems 'told' the drivers in question to do so.[9]

Even so, as we have seen is the case with car radio, in-car navigation has been around for quite some time. In the 1930s the Iter Auto navigation system was released (figure 2). The world's first dedicated automobile navigator used paper maps that were linked to the speedometer with a cable, thus scrolling through the map at a rate proportional to the vehicle's speed. As seen in the picture above the map only works on the longitudinal axis, the implication of which meaning that, when making a turn, the motorist had to change the map and correspond it to its current position.

I have unearthed historical information that is more in line with the systems we use today in the archives of Autokampioen magazine. In 1985 they ran an article on car navigation where dreams of 'smart

8 See for example the European advertising campaign TomTom ran which needed to communicate three key features; bet maps, safety and ease of use. The advertisement shows people in different settings using TomTom products that calculate the best route even when roads change, enabling drivers to go where they want to without care. Source: "TomTom Unleashes New European Advertising Campaign". TomTom. 3 Okt. 2007. Web. 12 Jan. 2014.<http://www.tomtom.com/news /category.php?ID=4&NID=411&Year=2007&Language=1>

9 Bridgestone has used these stories as inspiration to make a spoof commercial of a couple getting a ride of their lives, thanks to malfunctioning GPS and Bridgestone tyres. Levelwing. "Bridgestone Commercial – GPS." YouTube. YouTube, 1 Okt. 2010. Web. 11 Mar. 2013. <https://www.youtube.com/watch?v=B6sx7CyaMbg>.

environments' again emerged (appendix 3). As opposed to the Iter Auto, the newer systems would know the exact position of the car. While the radio was presented as a companion on long trips, the 'extra-terrestrial help' — as named in the article — in the form of GPS satellites assisted the driver in navigating swiftly to his destination, serving as a co-driver as you will. We have all heard failing GPS stories as mentioned earlier but the impression during the introduction of GPS systems was that it would be near impossible for drivers to get lost having an extra-terrestrial co-driver, an assumption that manufacturers or car rental agencies like to emphasise as can be seen in the naming the navigation service of car rental company Herz called 'NeverLost'.[10] Rightly so the author of the text critically reflects upon the way manufacturers and other stakeholders present these developments; "Without a doubt these futuristic perspectives fit perfectly in the strategy manufacturers adopt in trying to convey a progressive image" *[my translation]* (Hendriks 1985). While GPS in cars has been a unique selling point in cars of yesteryear, today's customers can have navigation in just about any car, or just use their smartphones or another mobile navigation device to find their way. Manufacturers are now more likely to focus on either internal safety driver assist systems and/or infotainment systems in order to market their vehicles as technologically innovative and 'smart', all the while conveying a progressive image. Using examples, I plan to show that the current focus of advertising is on presenting cars as a mobile office or a social hub by showing its connectedness with social network integrations like Facebook and Twitter, streaming music services like Spotify or Pandora in the US or e-mail and a variety of voice activated services. Two manufacturers who focus most prominently on displaying this progressive image to the public, namely Mercedes-Benz and BMW, will be presented as case studies.

With the introduction of the new A-Class in 2012 Mercedes-Benz strived to attract younger buyers to the brand by focusing on the connectivity features of the car (Paul McVeigh). One of their strategies was to use the new media-slang word recognised from the social Network Facebook 'iLike' in their print and tv campaigns.[11]

Figure 3 shows a print-media advertisement making use of this slang in order to connect to the world image of this targeted younger audience. It has a similar topos as the 1955s Philips car radio advertisement, saying you need additional services to ensure a journey; "No car fits more friends: Facebook, Twitter and the entire Internet all come together in your new A-Class. The pulse of a new generation".

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10 According to the rental company "the Hertz NeverLost is a sophisticated yet simple to use vehicle navigation device installed in select Hertz rental cars." Source: "Hertz Neverlost Home". Hertz. N.d. Web. 13 Jan. 2014. <http://www.neverlost.com/>

11 Video source: KTM-Dansch. "Mercedes A-Klasse i like Werbung." YouTube. YouTube, 28 Okt. 2012. Web. 18 Apr. 2013.
<https://www.youtube.com/watch?v=4KD_gzhgVAU>.

Figure 3: Mercedes-Benz A-Class print advertisement (2012)

It is striking that the focus on the advertisement is on the social network capabilities of the car with only the fine print displaying information about the cars fuel consumption and, in stark contrast to car advertisements from the seventies and eighties, there is no mention of engine features like displacement or turbocharging. Furthermore, while looking at their video advertisements (footnote 11), the focus is on the digital capabilities of the car. In a German advertisement of the A-class we see the car driving up to a diner. The driver gets out to get something to drink and the passenger decides to use the infotainment system to check out her Facebook news feed. When posting that she is in an A-Class a friend magically pops up on the back seat saying nothing but *I like*, then the like rating on her post goes through the roof as the car is being surrounded by youngsters pressing themselves up against the vehicle. Here the thumbs-up, used by Facebook as an icon until last year to signify the word *like*, is featured by one of the youngsters squashed against the passenger window (figure 4).

As previously mentioned, BMW also focuses heavily on connectivity in their advertising. It runs advertisements for its 'ConnectedDrive' suite where the car is, amongst others, being depicted as a 'mobile office' where travel time could be spent being productive thus improving ones efficiency. The slogan for the ConnectedDrive suite is 'so connected, you're free'.[12] Because there is more to do in in less time as BMW puts it, we have to be connected to make the best use of our time and by doing so we free up time to spend with family and friends. At the core of this slogan we again find a form of technological imaginary in the automotive industry showing a teleological

12 BMW. "BMW ConnectedDrive. So connected, you're free." YouTube. YouTube 12 Jun. 2013. Web. 20 Aug. 2013 <https://www.youtube.com/watch?v=1Opbe6PbbyI>.

Figure 4: Screenshot taken from the A-class video advertisement showing youngsters pressed against the window giving a thumbs-up (2012)

progress of technology. According to BMW, you actually free up time by using the ConnectedDrive suite, but they do not take into account that the more information one sends, the more he or she receives. Or as Mimi Sheller, director of Center of Mobilities Research and Policies puts it, "car journeys also may become important settings for clawing back 'quality time' in busy family schedules, at least until on-board DVD and games consoles become commonplace" (237). While the developments Sheller talks about are dated, I argue her main argument still holds, and looking at technological changes from this point of view we can therefore conclude that ConnectedDrive does the exact opposite as posed by BMW. Rather than freeing up the time of the driver, it essentially enforces the grip of media on the driver. In another video BMW markets the connected app, a part of the ConnectedDrive in-car suite as "[being] a really smart co-pilot that reads your Facebook updates out loud. All of them."[13] In the video the semiotics of social network services are also visible as is the case with Mercedes-Benz. In BMW's example the co-pilot — who depicts the invisible system reading the Facebook updates — is giving a thumbs-up (figure 5). These advertisements, as Huhtamo asserts, can serve both rhetorical and persuasive goals (28). In the examples shown here it is clear that car manufacturers appropriate rhetoric known from social networking sites and freedom topos of the information revolution. According to Huhtamo the use of topoi in advertisements is widespread as they have the ability to "provide a product or spectacle with a certain historical or cultural surplus value acknowledged by the observer" (39). Thus, the choice of carmakers to make use of topoi in their advertisements provides them with an futuristic image on one hand and on the other, by making use of historical molds people are ware of, make their product understandable for the viewer.

13 BMW. "BMW Connected App." YouTube. YouTube, 10 Feb. 2012. Web. 12 Sept 2013. <https://www.youtube.com/watch?v=O-iofRwckr4>.

Figure 5: BMW also featuring the thumbs-up in their commercial (2012)

Nick Bilton, technology columnist of the New York Times, writes that car manufacturers feel compelled to act in a time where youngsters seem to choose mobile phones over cars to express their liberation from their parents. While this liberation once entailed getting a drivers licence and hitting the open road it is now replaced by maintaining social connections through technologies such as smartphones. Manufacturers consequentially have to find ways to connect to younger buyers and therefore focus on marketing the technology inside the car instead of honing in on driving pleasure, as the Mercedes-Benz and BMW advertisements demonstrate. It is this movement that is speeding up the trend for drivers to have an inwards perspective whilst driving a car. In the text Sheryl Connely, Manager of Global Consumer Trends and Futuring at Ford Motor Company, gives another insight into the way car manufacturers perceive — and react to — teenagers and driving in a digital age; “Driving a car limits the valuable time teenagers could use to text-message with their friends or update their social networks”. It is this perspective that sprouts the development, implementation and subsequent advertising of new media in cars in an attempt to keep up with the changing world their future customers — today’s digital natives — live in.[14]

Another hype surrounding driver assist systems that re-emerged during the last decade is the autonomous vehicle, most prominently the Google self-driving car founded by Street View Engineer Sebastian Thrun in 2008. In his words Google technology will help ‘create the new highway trains of tomorrow’.[15] While the term ‘road-train’ is

14 The European Automobile Manufacturers’ Association indicates it is also bound by the EU Car Labelling Directive that amongst others state that avoiding advertising messages based on speed or performance is best practise. <http://eur-lex.europa.eu/LexUriServ/site/en/consleg/1999/L/01999L0094-20031120-en.pdf>. van Echtelt, Antoine. "Questions on EU car advertisement regulations" Message to Charles de Lusignan. 18 Dec. 2012. E-Mail.

15 Thrun, Sebastian. “What we’re driving at”. Official Google Blog, 9 Okt. 2010. Web. 23 May 2012. <http://googleblog.blogspot.nl/2010/10/what-were-driving-at.html>.

mainly used to indicate trucks with exceptionally long trailers in the Australian Outback, has been borrowed by the automotive industry. The image they try to convey is a remediation of the train that was used as the main mode of transportation in the period of industrialisation, with the cars acting as the carriages as described by historian Gijs Mom (2005).[16] Unlike the train carriage it provides more of a personal space for its inhabitant(s). However, while this carriage provided the comforts of relative privacy – depending on the passengers – the inhabitant of the car became a driver and the machine both bestowing and requiring actions from him. Now manufacturers are trying to counteract the role of the driver by returning the car to its historical ideal; a driverless carriage.

As I have shown manufacturers have shifted their focus from displaying the car as an ultimate freedom machine towards the car as a place where your friends, colleagues, et cetera are your permanent co-drivers. It was only about a decade ago that Jacobson described the car as "the last private space in an overwhelmingly public world . . . the worse it gets on the roads the more we seek the solace of our vehicle" (Jacobsen qtd. in Bull 358-359). The implementation of infotainment systems by manufacturers might lead to the demise of the car as the last private space as Jacobson puts it dramatically. Only time will tell whether motorists will actively use these systems or 'opt-out' of these technological advances in order to keep or regain their cars as private space. But, as shown in the last part of this chapter, opting out of technology is not always a choice the motorist gets to make. Transforming the car into a horseless carriage seeks to eliminate driver input what, as I have shown, has been a desire of manufacturers since the early 1930s. It has become apparent in this chapter that there is progress in the car industry but it does not follow a lineair path. In the newer advertisements we have seen similar topos at work that focusses on advertising an utopian future car. Huhtamo has acknowledged this trend of selective historical memory that can be unearthed when doing media archeology as he writes that "in spite of the postmodern mania for storing and archiving, there are trends that still aim at effacing the past, or at least selectively rewriting it" (51).

When we see the car as an environment in itself that seeks to eliminate driver input we could say that the technology tries to influence the driver. In the following chapter I will show that humans and technology are deeply interlinked. The technology in itself, its designers and its users play various roles in the coming together of the car as a network as will be explored in the coming chapters.

16 The EU funded project SARTRE uses the road-train metaphor in their project name to explain their technology; Safe Road Trains for the Environment

“VEHICLES ARE INCREASINGLY HYBRIDIZED
WITH THE TECHNOLOGIES OF THE MOBILE,
PERSONAL ENTERTAINMENT SYSTEM AND
LAPTOP COMPUTER . . . THUS ANY VEHICLE
IS BECOMING MORE OF A ‘SMART HOME’
AWAY FROM HOME” (JOHN URRY 2004.: 34)

2

EXPLORING SMART ENVIRONMENTS

The advent of the microprocessor and miniaturisation of technology has paved the way for computing power to become ubiquitous in our everyday lives. As shown in the previous chapter a modern day car contains between 50 and 100 processors but they pervade more areas of our life, be it from mobile devices like smartphones to home appliances like thermostats or refrigerators. But how are smart environments constituted? Is it as simple as placing computing power in a previously analogue device to say it has become smart?

Investigating how smart environments are formed in everyday life gives us a comprehensible basis for exploring how the car is formed as a smart environment in the next chapter. It will also help answering the question of how new technologies find a place in an existing technological environment. This is of importance as the placement of digital technologies within the confines of the car has sprouted the car industry to adopt popular media rhetoric and as discussed make extensive use of myths to present — and ultimately materialise — it as a smart environment.

To do so I will first define what a smart environment is and how it has agency by focussing on the blurred boundaries between humans and technology that emerge as a result of ubiquitous computer technology. It aims to lay the foundations for the third and final chapter in showing how smart environments are constituted using ambient intelligence and persuasive technology. I will briefly touch upon the two dominant stances in science of technology to show that the dominant view of technological determinism shown in popular media and the car industry alike does not help our understanding of the subject at hand any further. When talking about technology it is easy to forget that an object in itself is formed by a network of many actors (Latour 128). In order to fully understand how smart environments are formed we must therefore understand the proces how technologies are created. To do so I will make use of Brian Winston's innovation model that aims to make visible how new technologies are formed, and as discussed complement this model with an actor-network theory perspective to make the actors, both human and technology, visible. His model shows amongst others how inventions are mediated and have their radical potential suppressed. The application of the model in the last chapter will helps us gain insights into how smart car technology is truly appropriated as we explore the myths of the automobile as a smart environment.

According to Winston, the concept of the information revolution — whose topos has been claimed by the car industry — is "largely an illusion, a rhetorical gambit and an expression of technological ignorance" (Winston 2)

2.1 DEFINING PERSUASIVE TECHNOLOGIES

Defining and exploring the meaning of the three main terms that encompass this chapter, *ambient intelligence*, *smart environments* and *persuasive technology*, is of importance as these will be at the core of my exploration of the presentation of the automobile as a smart environment in the next chapter. Three academics associated with both the Technical University and the Philips Research Laboratories in Eindhoven, Aarts, Harwig and Schuurmans, define ambient intelligence as "electronic systems that are sensitive and responsive to the presence of people" (qtd. in Aarts and De Ruyter 5). These systems can be embedded in a vast array of objects in order to make an environment *smart*. In an early exploration of these new conditions Diane Cook and Sajal Das wrote the comprehensive work *Smart Environments: Technology, Protocols and Applications* (2005). According to them smart environments are adapt at acquiring and applying knowledge in an environment thereby making it possible to improve the experience of inhabitants of that environment (Cook and Das 3). These environments can range from people's homes, hospitals or, as argued in this thesis, an automobile. Most of the technology in these smart environments can be used to deliberately influence the ideas, intentions and behaviour of human beings thus persuading us to act in a certain manner (Verbeek 2009: 231). These technologies that influence our ideas and steer our behaviour are called persuasive technologies. B.J. Fogg, Founder of the Persuasive Tech Lab at Stanford University opts for a similar definition as given by Verbeek and defines persuasive technology "as any interactive computing system designed to change people's attitudes or behaviours" (Fogg 1). Smart environments thus integrate both persuasive technologies and ambient intelligence to adapt to its inhabitants. While these smart environments are not exclusively limited to spaces in a building the metaphor of a living room is a well-known example to illustrate a place where convenience is of upmost importance. Car manufacturer Ford exemplifies this by using the slogan "The '49 Ford will be a Living Room on wheels!" in an advertisement explaining the features of their new 1949 models (appendix 4). As has become apparent in the previous chapters, carmakers frequently appropriate rhetorics from the information revolution to show technology is making their smart and reay for the future. But it is not only the car manufacturers that spread myths, dreams and desires of future cars. Popular media like newspapers have run headlines such as 'the car as a computer on wheels' for several decades, tapping into myths like those of linear progress.[1] Winston also notices this when looking at the ideals and myths that come with the so-called information revolution and writes that "the popular literature on these matters and the media resound with visions of techno-glory or apocalypse, the same set of phenomena being the source for both styles of pontificating" (2).

Both popular media and carmakers, the latter in their endeavour to emphasize the newness of their developments, take position in the field of technological determinism. As said and shown earlier this dominant view permeates both the advertisements and the way popular media covers automotive developments. In order to show how this dominant rhetoric of technology is structuring the discourse of smart cars I will show how technological determinism is positioned in the field of science and technology studies.

2.2 POSITIONING THE AUTOMOTIVE INDUSTRY IN SCIENCE AND TECHNOLOGY STUDIES

When I mentioned the coalescence of social and technological constructions in the introduction I briefly introduced the opposite stances in science and technology studies. In order to gain a better understanding why I chose to embed both the technological and social perspective in Winston's framework and how car manufacturers appropriate myths of the information revolution it is essential to explore the position of social constructivism and technological determinism in regards to the car. I will thus start by defining technological determinism and its 'counterpart' social constructivism which, as mentioned, together form the two most extreme positions in the field of science and technology studies (Foltz 2006; Hanseth and Monteiro 1998). It is important to note that these two fields have several positions in themselves but for now I will focus on the perspectives most significant in relationship to the car. It is also important to note that most science and technology scholars do not choose to position themselves in either of these two extremes. As Langdon Winner, a prominent researcher in the field Science and Technology Studies notes, technology and human culture are inextricably linked together (54). This means that positioning one over the other will result in partial research. Thus when I refer to the force field that exists between technological determinism and social constructivism I use it as a conceptual framework to help explore the field of Science and Technology studies and introduce my position that I find to be most fruitful in order to pursue my research. I will first explore technological deter-

1 The Dutch paper *De Telegraaf* ran a headline 'Straks rijden we in computers' [later we will drive in computers] in 01-02-1989 (appendix 5), with *Financieel Dagblad* running a similar headline some two decades later proclaiming 'Autorijden in 2020: computer op vier wielen' [Driving in 2020: computer on four wheels] 19-05-2012 (appendix 6).

minism, then social constructivism and from thereon show how ANT helps us gain better insights by incorporating it as looking glass to observe Winston's model.

In illustrating how technology affects society Langdon Winner writes that technological determinists see technological innovation as the basic cause of change in a society and that humans have little choice but to accept this inescapable proces (9-10). This hard definition of technological determinism has been toned down somewhat as the debate unfolded over the years. Two distinquished historians of technology affiliated with the Massachusetts Institute of Technology, Merrit Roe Smith and Leo Marx, illustrate a softer view by saying that technological determinists believe that society is shaped by its technology and assume that changes in technology exert a greater influence on societies and their processes than any other factor (Smith and Marx 2). Media Theorist Marshall McLuhan gives an example of a technological determinist view in the field of automobiles. In his ground-breaking work *Understanding Media* (1964) he argues that the system of the car is an extension of man that turns the driver into a superhuman (246). According to McLuhan the American car levels all social differences and makes the pedestrian a second-class citizen, whilst its smaller European counterparts can reduce the driver to near-pedestrian status; "some people manage to drive them on the sidewalk" (McLuhan 243/246). Although McLuhan cannot be seen as a technological determinist per se, he asserts here that technology shapes the social sphere. In this example the choice to design a car that is so small that it can be driven on the sidewalk might provoke the driver to do so. A more sinister but arguably more memorable example of technological determinism is given by Theodor Adorno in 1942 as he asks "and which driver is not tempted, merely by the power of the engine, to wipe out the vermin of the street, pedestrians, children and cyclists?" (Adorno qtd. in Urry 29). As both Adorno above and Bull in section 1.5 argue, the technology of the car gives the driver superhuman strength and tempts us to act thereupon.[2] On another level and as also discussed earlier, technological determinism can likewise be seen in advertisements in popular media such as newspapers and so forth. Professor of Management and Organisation Paul Adler corroborates this remark with a similar viewpoint as Winston in section 2.1 by saying that technological determinism "figures prominently in the popular imagination and political rhetoric, for example in the idea that the Internet is revolutionising economy and society" (n. pag.)

2 In a radio speech held 29th of January 1955 princess Wilhelmina of the Netherlands pressed the need for more courtesy on the nations roads. She asks the question if the 'will-less engine of the car not eventually obeys to the inner condition of its driver' [my translation] (appendix 7). As opposed to Adorno she disregards the agency of the technology itself, opting for a social constructivist view.

Social constructivists on the other hand say that technology is influenced by society. They reject the notion of technological determinists and instead focus on the social construction of artefacts. John Law, a key contributor to actor-network theory and firm believer of interdisciplinary research, defines social constructivism as a science that believes "that artefacts and practices are underdetermined by the natural world and argues that they are best seen as the constructions of individuals or collectivities that belong to social groups" (Law 1987.: 111). So artefacts and practices are being constructed by individuals or collectivities and only then form meaning. In their research of the social construction of the automobile in the rural United States, Science and Technology scholars Ronald Kline and Trevor Pinch found that the Ford Model T was not only used as a car but also as a tractor substitute and as power source for a sawmill, washing machine et cetera (Kline and Pinch 785). So while one social group might see the car as a means to shorten time and space others can see it as a means to enhance their productivity. In section 3.1.6 I will show that it is rarely the case that technology is solely used in the way its designers intended.

The problem with both technological determinism (TD) and social constructivism (SC) is that they insufficiently take the actorship of either the social or the technological into account (Verbeek 2011.: 26). As argued earlier by Winner humans and technology are inextricably linked, thus positioning one over the other becomes problematic. Actor-Network Theory (Latour 1987; Callon 1986; Law 1987) seeks to find a common ground between TD and SC by acknowledging that both technology and humans have actorship. It is a constructionist approach in the way that it does not put essentialist explanations on the subject of study. Instead it searches for networks from a material semiotic perspective. According to Latour we can study things in the world from the viewpoint that human and non-human actors are interconnected in a network. It is only because of these mutual relationships that agency is formed in the network. So both humans and technology are important in the formation of a network, and they should be studied accordingly.

The car is a prime example of where humans and technology come together and can be seen as forming a relationship. In his work *Reassembling the Social* (2005) Bruno Latour provides an insight into how the actor-network theory can help us understand the relationship of the car, the driver and its environment. He asks if the difference is big or small between driver A who slows his car down because of a 30mph sign, and driver B who slows down to save the suspension of his car because of a speed bump on the road (2005.: 77). According to Latour both driver A and driver B pass trough the same stages of morality, symbols et cetera but driver B encounters an extra obstacle, the concrete slab in his path that changes the dynamics of the situation. On one hand it can be seen as a big difference. On the other hand it can be seen as slight as both drivers obeyed something. Whereas the first driver stops due to his own morality the second is slowed down by both an external factor — the speed bump — and internal because of his efforts not to damage his automobile. Latour asks if the first connection is social, moral and symbolic and the other objective and material, only to counter it by saying that if both are seen as social the material difference of the speed bump and suspension is not taken into account (ibid.: 78) He concludes that both driver A and driver B might not be seen as social all the way through but that they are associated together by the work of the road designers (ibid.).

2.3 PERSPECTIVES ON HUMAN TECHNOLOGY INTERACTION

As I have discussed above humans and technology are intertwined and mutually influence one another. Throughout history we humans have used technology as a means to go 'beyond' ourselves. Converting trees into canoes to be able to transport goods faster using waterways or inventing the wheel as a means for humans to travel faster on land which has drastically influenced our perception of time and space. According to Philosopher of Technology Peter Paul Verbeek we have used and in fact been intertwined with technology for thousands of years (2011.: 79). Furthermore, as it became apparent in the more recent example of the speed bump, it is clear that technology influences us in diverse ways.

In order to think about the implications that development of technology has on humans and society as a whole, Peter Paul Verbeek uses the cyborg as a metaphor to show that "the technical and the human are molten into one new entity" (Munnik 1997 qtd. in Verbeek 2011.: 25). He borrowed the term from Sociologist Donna Haraway who coined the metaphor of the cyborg in her seminal essay *A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century*, first published in 1985. According to Haraway, the cyborg is a creature that blurs boundaries, because it does not have to abide by the boundaries set for humans (291). In her essay she calls for a shift beyond object–subject thinking, hereby transgressing the distinction between humans and technology.

Haraway contends that we as humans exist in relation to technology and it becomes more and more difficult to make a distinction between what is human and what is technology. This is most visible in the ways smart environments react to their surroundings, as shown in the previous chapter. And as I will show in section 3.2 this blurring of what is human and what is technology has severe implications on the debate of autonomous cars and liability. There I will also argue that the terms hybrid and cyborg do not fit within the context of the car — while drivers may know the feeling of being at one with the car —as I will show it is a temporal connection that can be easily broken. It is however important, as Haraway has noted, that miniaturized technologies make it more difficult to view the relationship between humans and technology because of the fact that these technologies become pervasive and at times even invisible to the eye (275).

This pervasive computing makes it evermore important for designers and engineers alike to think about the possible (inter)actions their technologies afford. In researching automotive technology and user culture Mobility Historian Mom et al. found that designers and engineers have a preconcieved idea of the use of their invention that is not necessarily consistent with the way a consumer will use the product (324). Latour corroborates the account that users may use technologies provided to them in ways unthought-of by their designers, and "rather than following its assigned program of action, a user may use the system in an unanticipated way, he may follow an anti-program" (1991.: 105). For instance, a hammer is intended to drive nails into primarily wood surfaces, but it can also be adopted as a doorstop. While this example of an anti-program is quite harmless one can imagine that with a high-powered and heavy object like a car the stakes to map as much anti-programs as possible are a tad higher. The example of small cars and driving on the pedestrian walkway given by McLuhan in section 2.2 while extreme proves this point. Designers have a moral responsibility to incorporate as many uses as they can think of and find solutions to these problems. It is not fruitful — and quite impossible — to reject the use of technology as a whole, considering technology is an inextricable part of human nature and new developments will only give us a more radical interpretation of technology (Verbeek 2011.: 79). This radical interpretation is to acknowledge that both the technical and the social have agency in the shaping of technologies. Now, having set out the positions in science and technology studies I will introduce Brian Winstons model on technological change which, combined with terminology actor-network, will in the subsequent chapter enable us to discuss the formation of the car as a smart environment without falling either in technological deterministic or social constructivist traps.

2.4 WINSTON'S MODEL OF TECHNOLOGICAL CHANGE

In the late 1990s Media and Cultural Studies Theorist Brian Winston developed a model to study the emergence of new technologies from an historical perspective. His model counteracts the stance of technological determinists by opting for a social shaping view of technology. He sees technology as standing in a structural relationship to science, being brought together in the social sphere (figure 1). According to Winston technologies are a performance of scientific competence and

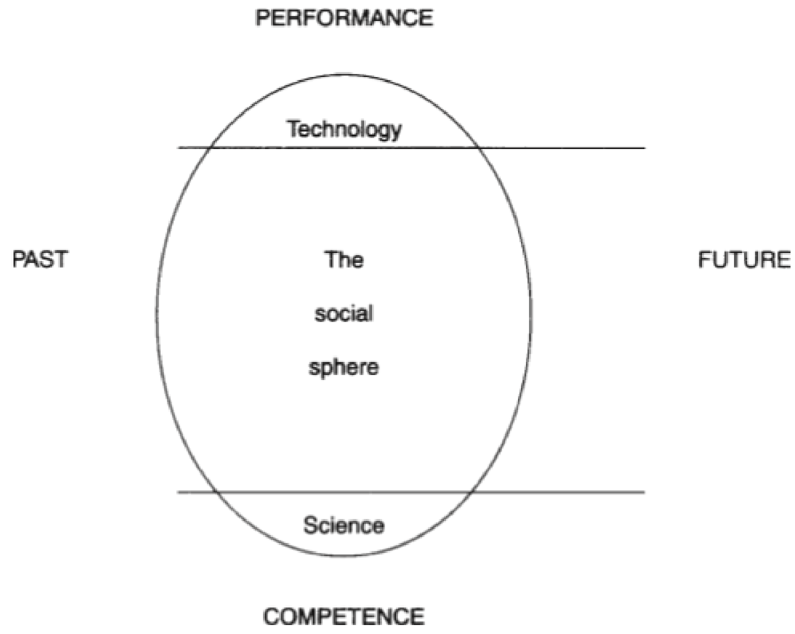

Figure 6: Schematic view of the social sphere

science itself occurs within and is infected by the social environment rather then being abstracted from it (3). In this section I will explore the model on a macro level before putting it into practice in the development of the car as a smart environment.

Winston has divided his model into six stages through which an invention will pass. They are *ideation*, *prototyping*, *supervening social necessity*, *invention*, *suppression of radical potential* and lastly *diffusion*. Following these stages will make it evident that technological development is not lineair as the car industry purports it to be, and that rhetoric appropriated by the car industry based on myths of the information revolution brings about important discussions on privacy, law and ethics. I will briefly introduce each of these stages, as they will be analysed in detail in the next chapter with the goal to show how (new) technologies find a place in a existing technological environment, namely the car.

In the ideation phase, the first phase, a technologist whom envisions a device takes up scientific competence. In other words scientific knowledge is tested as a solution to a problem. While the technological idea will be grounded in scientific competence, it does not necessarily have to relate directly to science according to Winston. He uses the word science broadly and in line with its original meaning as the acquaintance with or mastery of any department of learning (Winston 3). Moreover he argues that a "lack of formal scientific knowledge is no bar to technological performance" (ibid. 5). The envisioned device shifts to phase two.

The second phase of Winston's model is the prototyping phase. In this phase the idea from the first turns into one or more proposed prototypes. While I have talked about the influence that technology has on us as humans Winston shows that society itself is also an influential factor. When talking about the invention of technological systems we have to keep in mind that scientists are, as social beings themselves, influenced by the culture in which they grew up (Winston 5). This signifies that the ethics in a design are the product of not only the scientist or developer of a system, but also of the very culture in which the development has taken place.

The third phase of the innovation model are generalised social forces that have thus far determined the process of innovation, called supervening social necessities. Winston states there is no limitation on the forces that may act as a supervening social necessity and that they can range from competing technologies to commercial actors (Winston 6). These supervening social necessities shape several prototypes, one of which will eventually form the fourth phase, the invention.

The invention is the prototype that has the best widespread social necessity. However this is not to say that the prototype turned invention will in turn be a successful device as acceptance is never straightforward, regardless of its necessity;

> "Acceptance is never straightforward, however 'needed' the technology. As a society we are schizophrenic about machines. On the one hand, although perhaps with an increasingly jaundiced eye, we still believe in the inevitability of progress. On the other hand we control every advance by conforming it so that it 'fits' to pre-existing social patterns" (Winston 11).

Winston corroborates Verbeek in saying that we are naturally afraid of technology and need to learn to relate to it (11). From an ethical perspective manufacturers can choose to adopt a part strategy in which a development, the driverless car for instance, is slowly ushered into being and the idea of technology having explicit power over us is moulded carefully into the minds of current day consumers. Professor of History George Basalla shows that this move of operation does not always prevail by listing developments rejected by the public or where technological problems could not be overcome, like with the Wankel engine, gas turbine powered cars and the combined automobile/airplane developments of the 1930s (143).

The public or technology has the power to suppress the radical potential of an invention, which is the fifth phase, which means that an invention is suppressed by social forces that allow it to act in certain ways that are in line with their 'old' views and uses. Winston cites French historian Fernand Braudel on the feeling of technological

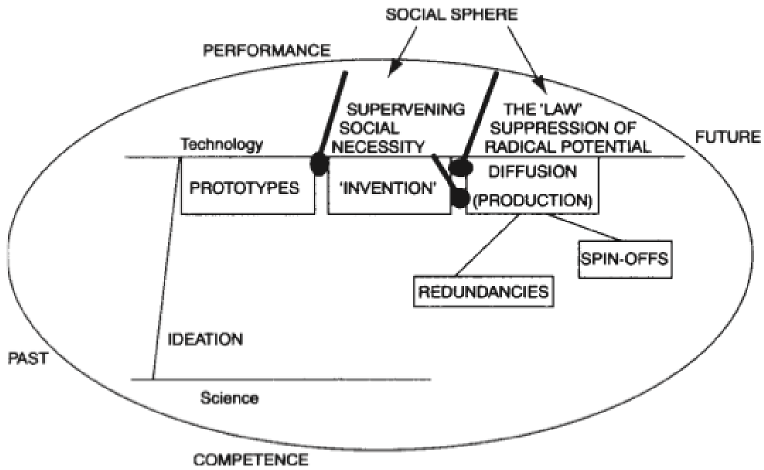

Figure 7: Complete overview of Winston's model

progress; "First the accelerator, then the brake: the history of technology seems to consist of both processes, sometimes in quick succession: it propels human life onward, gradually reaches new forms of equilibrium on higher levels than in the past' (Braudel qtd. in Winston 11). Braudel argues here that while there is some sort of progress in developments this is not a linear path where all inventions are necessarily an improvement on the preceding invention. Furthermore, developments are being absorbed by social conventions and slowed down when they are deemed too radical. Winston calls this the 'law' of the suppression of radical potential (11). It could be argued that due to this 'law' electric cars like GM's EV-1 and Ford's Think have failed, since they needed to feel like conventional cars and thus deliver the same pleasures of driving; quick acceleration, speed and range (Scheller 237).

The last phase of Winston's model is diffusion, as can be seen in figure 2. In this final stage the device can be appropriated for uses other than its intended ones and used as a spin-off. It is possible in this phase to modify, extend or refine the device or come up with alternative solutions to the same problem. For instance videogames have extended the use of microchips in a way in which they were not intended (Winston 14). A current automotive example of spin-offs is the development of mobile phones powering in-car information systems (Bose, Brakensiek, and Park; Bose et al.; Geier et al.).

As earlier discussed, technology cannot be seen as having a fixed position; it influences humans and society on multiple levels. This in turn means we cannot see ourselves – humans – as being a fixed entity. Because of the interwoven quality of our relationship with technology the 'human condition' is no longer a given and this fluidness makes it impossible to establish an ethical framework with which to guide ourselves (Verbeek 2011.: 80). As actor-network theory argues we should not stick to the object versus subject dichotomy as this only reinforces the divide between *us* as subjects and *it* as technology. In the following chapter I will use this theory as a looking glass to show how not only subjects but also objects have agency and are in fact agents in the creation and sustaining of the car as a smart environment. Moreover I will argue that the car is pre-eminently a construct where subjects and objects come together. As has beome apparent myths play an active role in the shaping of the future car. By showing an utopian future car manufacturers actually compel themselves to materialise these future outlooks. Technology, or rather objects, as well as subjects such as the employees of the car manufacturer thus both play an active part in the shaping of the world of tomorrow. When delving deeper and looking at the way how the fulfillment of these myths affect subjects in the technological ecosystem that is the car we can see a dichotomy again, technology purportedly granting us freedom while on the other side we might feel as if we are slaves to technology. To fully understand the rhetoric and myths appropriated by the car industry is thus to focus on both subjects and objects, human and technological actors. From a practical standpoint this also means that, as discussed throughout the phases of Winston, designers and manufacturers have a responsibility to account for the diverse ways in which their futuristic technologies cemented in rhetorical gambit might be appropriated. While it is difficult to grasp the effects of their design to the full extent it becomes apparent that when users have the feeling that they are steered by technology and loose autonomy they feel threatened (Verbeek 2009.: 235) and in turn will seek ways to work around the threatening technology and re-establish a sense of freedom. However, as I will make clear in the following chapter, there is no such thing as absolute freedom as countering forces are needed to create a sense of freedom to start with.

“THE AUTOMOBILITY THAT IS REALIZED IN THE DRIVER-CAR SERVES AS BOTH AN EXTENSION OF THE HUMAN BODY AND AN EXTENSION OF TECHNOLOGY AND SOCIETY INTO THE HUMAN” (TIM DANT 2004.: 75)

3 CREATION OF THE SMART AUTOMOBILE

The examples presented in the first chapter made apparent that, almost directly from its inception, the car can be seen as a smart environment in the broad sense of the term. The driver is not merely a figure to control technology, but the technology in itself asserts control over the driver. Illustrations and the odd video made between 1930s and the early 1960s show visions of the car as a luxurious and mainly driverless carriage for family transport, enabling the motorist to relax and spend quality time with its passengers (appendix 8). In the advertisements of today, as presented in the first chapter, the image appears to have shifted. Visions of driverless cars have seemingly disappeared. And where old advertisements painted a picture of family life coming together to have fun, the new advertisements as exemplified are focussing on the perspective of a single driver, who uses on-board apps to enhance productivity, and as opposed to the advertisements of days gone by, are maintaining their social relationships via the digital communication tools of the car.

In this chapter I will combine the statements gathered during my media archeological research conducted at the time of my internship and combine this with Winston's model to reveal how infotainment systems have evolved over time, and have in effect tried to transform the car into a smart(er) environment. A large part of the content of the analysis is mustered from conversations with members of the car industry in, amongst others, London and Geneva, which took place during my internship period. To conclude this chapter I will extend Winston's model by introducing philosophers Don Ihde and Bruno Latour to overcome the lack of emphasis Winston places on the agency of technology. By structuring my argument around the four human technology relation types as described by Ihde — *embodiment*, *hermeneutic*, *alterity* and *background relations* — it provides me with a framework to discuss human technology relations which actor-network theory, in its aim not to categorise statements beforehand, does not offer. In order to explore in what ways the automobile is being constituted as a smart environment we have to focus on the inception of the object to its eventual being in the world, and see which actors play a role in its formation and technological and social construction. When looking at the car purely as a technological object we obstruct our view of the developmental process of the car. I will counter this by opting for both a social and technological viewpoint which enables me to see how these actants influence each other while trying to deliver on their promise to present us with 'smart cars'.

3.1 APPLYING WINSTON'S MODEL

In the previous chapter we have discussed Winstons model of technological development and by viewing it from technological determinist and social constructivist perspective it became apparent that while useful, the model tends to disregard the shaping power of (imagined) technologies. Thus I proposed to build upon the model by incorporating actor-network terminology which gives us the means to discuss both the human and the technological aspects. Now we will apply this model to explore in-car systems to show how myths and rhetoric play an important role in the formation of technologies and idealisation of the future automobile. It will become apparent that these myths have sprouted action from a diverse array of actors that contribute in the efforts to turn the car into a smart environment. To see which actors play a forming role and how they do so, we have to deconstruct the technologies as it is only then that we can see how they are formed under influence of both human and technological actors. By using the phases of technological development as set out by Winston as a framework in the following section I am able to systematically show actants in different stages of technological development, thereby evading the risk of a lineair historiography. Before applying Winston's model as introduced in section 2.4 to inventions of car media it is important to acknowledge that the lack of standardisation in the field of infotainment systems will inevitably influence the structure of the model, as the systems are continuously in flux between the prototype and invention phase. Winston acknowledges that the difference between prototype and invention is not as rigid and calls the invention the fifth class of prototypes (9). According to Ian Kendall, Head of Infotainment and Audio at Bentley Motors, the reason why standardisation is lacking in infotainment systems is due to the fact it is very difficult and takes a long time to come to agreements meaning that by then the technology has already changed (Kendall 2012). As it is my goal to show the general direction of infotainment systems that make the car a smart environment and not focus on a single manufacturer, I will group these systems under the term *infotainment system*. As the definition of infotainment systems given in section 1.3 encompasses a system that in itself is made up of multiple systems it will provide a suitable overarching definition. This does not mean to say that I will not focus on single developments or concepts that can be placed within the infotainment ecosystem, as I will use them as cases throughout when discussing and applying the model.

3.1.1 *Ideation*

Dreams and desires of smart cars have been around for quite some time as previously contended. A person with a vision or dream is

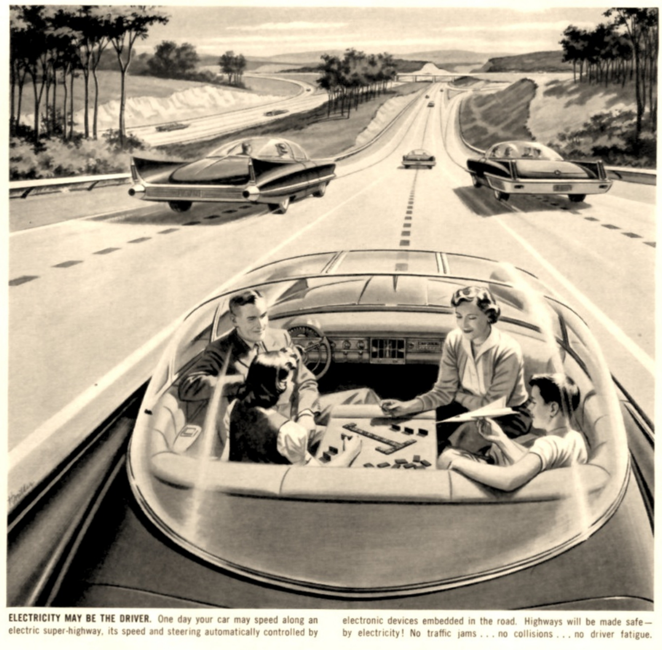

Figure 8: The 'electronic super-highway' affords motorists to relax whilst en route (1957)

the first step for an invention to take place. In visions of the fully automatic car the motorist would literally be able drive hands-free, in order to grant the driver the luxury of focussing on tasks other than the driving task. One can say that these visions of driverless cars have facilitated ideas of embedding some sort of entertainment system in the car, as I will show with examples of early advertisements further on. These visions bring us to the first phase Winston has defined, the ideation phase, where technology travels from the field of science upwards towards the field of technology (Winston 4). An advertisement from 1957 of driverless cars gives us an insight in the ideation of the car of tomorrow and a actor that pushed this image. A snippet from the advertisement in figure 1 shows a family in a car playing a board game without having to pay attention to the road or traffic around them as the car speeds along driving itself on a 'electric super-highway' (the full advertisement can be found in appendix 8).

In this advertisement, ran by a partnership of America's Independent Electric Light and Power Companies, it is argued that 'electricity may be the driver' as 'your air conditioner, television and other appliances are just the beginning of a new electric age'. This advertisement contains a topos of change similar to advertisements discussed earlier, that promised an information revolution with the coming of a digital age. It also clearly shows that companies who will benefit from this new electronic age congregate and together take up the science of electronic competence in order to transform it to their needs by showing the general public a view of the electrified (near) future.

In a future outlook from the same era, General Motors' *Key to the Future* video (1956) depicts a similar image showing how electronic driver aids enable the driver to relax and consequently spend his time with the family on board.[1] In this promotional video we see a driverless gas turbine powered car being presented much like the previous example of the electronic super-highway only here the advertiser is a car manufacturer instead of an energy conglomerate. Before enabling the autopilot the driver is given a choice between two routes that are mapped on his screen, a green route marked *scenic* and a red route marked *short*. The driver chooses the scenic route and checks the information of vital systems such as engine temperature, RPM and fuel level on his dashboard. All systems are good and a nearby highway control tower is called via radio. The following conversation takes place;

> Driver: "We're all set for auto control"
>
> Control Tower: "Roger Firebird 2. Move to electronic control strip in centre lane. Synchronise your speed and direction."
>
> Driver: "Check, I'll tune speed first and now I'll tune direction"
>
> Passenger: "We're coming in on the beam Dan"
>
> Control Tower: "Well done Firebird 2. You are now under automatic control. Hands off steering"

Cheerful music starts playing and the family helps themselves to onboard ice cream and cool drinks while the driver fires up a cigar. The advertisement eventually ends with the whole cast joyfully singing together, praising the future of motoring.

3.1.2 *Prototyping*

In the world of today we have replaced the new electronic age of the 1950s with the digital age. The prototypes of in-car systems have consequently shifted from an electronic viewpoint towards a digital perspective. As with the examples of days gone by, current prototypes tickle the imaginary power of the spectator today. According to Media Archaeologist Eric Kluitenberg these prototypes give rise to intense speculation of what such machines might be able to achieve or signify and, moreover, show that imaginary media are not simply fictional objects (66–67). Huhtamo agrees and writes that unrealised 'dream machines' or discursive inventions can be just as revealing as

1 CBS Sunday Morning. "From 1956: A future vision of driverless cars." CBS. YouTube, 19 Jan 2014. Web. 10 Feb. 2014. <https://www.youtube.com/watch?v=F2iRDYnzwtk>.

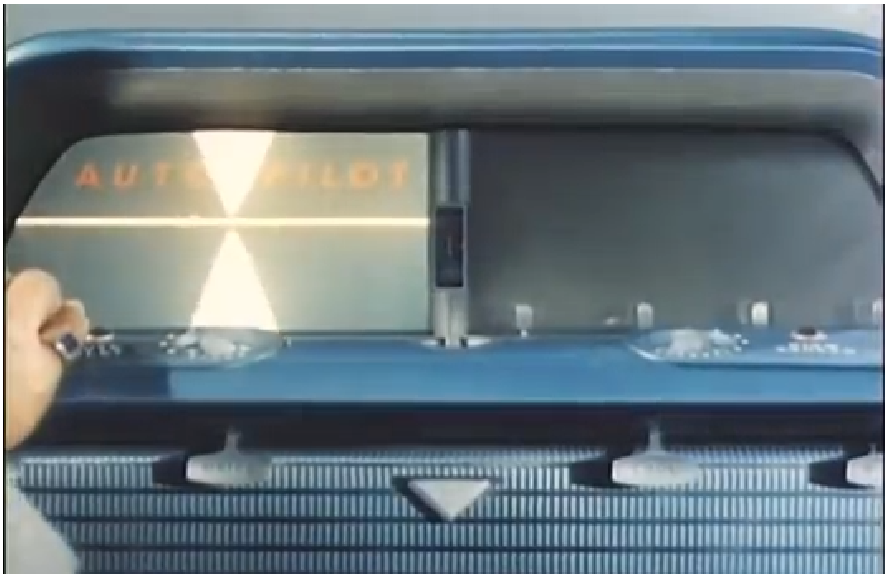

Figure 9: Screenshot of Key to the Future showing the driver aligning an electronic beam by turning dials on his dashboard to enable the autopilot (1956)

realised artifacts (1997.: 223). While car manufacturers take the utmost precautions to secure their research and development efforts, they do like to show so-called future outlooks and proof-of-concepts to convey their status of industry leader to the public. In this phase I will therefore introduce a user interface prototype of the car of tomorrow as envisioned by Mercedes-Benz called the Dynamic & Intuitive Control Experience (DICE). I will use this example as it is one of the more striking outlooks of the future of in-car media and properly shows the automakers' vision of transforming the car into a medium rather then just a means of transport. While these outlooks may be experimental and research in closed off R&D facilities is neigh on impossible I argue that they convey the manufacturers' viewpoint of motoring future to a certain likeliness as to what they are developing for real world developments. As DICE is a future outlook and not yet subjected to outside forces I will not be able to discuss the four different classes of prototypes that Winston distinguishes in his work in this example (8). Instead I will introduce these classes of prototypes in section 3.1.6 where I introduce the workload manager as a diffusion being brought to life at the hands of the law of suppression of radical potential.

Mercedes-Benz presents their DICE system with the words: "Gesturing to the future. Capable of recognising and using a driver's hand movements to create a custom virtual dashboard, complete with live feed from their social network, the DICE concept represents our commitment to the kind of innovation that answers and even anticipates drivers' needs" (Mercedes-Benz TV) (See figure 3).

Figure 10: The DICE concept featuring gesture control and augmented reality windscreen (2012)

In another video they opt for a similar approach as BMW by saying digital tools will provide the driver with more freedom; "As the digital lifestyle extends to a digital drivestyle the car will provide even more freedom" (2012 CES Highlights). They go on to say that the car has become the ultimate consumer electronic device, thereby enforcing their view of the car as a medium.

The way in which the DICE system is presented by displays yet again how carmakers hold the belief that more technological systems will lead to more freedom of the driver. This belief is grounded in the standpoint that the less a driver has to focus on the driving task, the more freedom he or she has to do the things that he or she wants to other than driving. However, as outlined in the second chapter, this technological deterministic train of thought is problematic for at least three reasons. First, the driver is still a part of the human-car assemblage and his actions are therefore shaped by the affordances of the automobile. On a basic level this is apparent as the driver is for instance confined to the physical environment of the car and is unable to cook a meal or take a shower. Secondly, the so-called freedom that the driver gains is instantly being confiscated as carmakers implement new in-car media capabilities in their models, such as Twitter or Facebook integration, thereby actually claiming back freed up time gained from auto-pilot systems. The third premise is a disregard of the role of the driver as a supervisor over the systems. As we know from other places where humans rely on technological systems or even robots, these systems can go awry thus they need human supervision. This is most apparent in the aviation industry where autopilots and workload managers have been used for quite some time. In early 20013 the Federal Aviation Administration (FAA) published a safety alert for operators (SAFO) which stated that "autoflight systems are useful tools for pilots and have improved safety and workload management, and thus enabled more precise operations. However, continuous use of autoflight systems could lead to degradation of the pilot's ability to quickly recover the aircraft from an undesired state".[2]

So according to the FAA prolonged use of pilot assist systems leads to deterioration of human skill while this skill might be called upon when technological systems fail. Why would driver assist systems be different from pilot assist systems?[3] The human factor in these technologies is identical to the case of the car. By stretching the line of reason put forth by the FAA into the automotive realm, driverless cars would still need human supervision as technology can potentially fail. In turn this means that the topos as seen in future outlooks and prototypes of car manufacturers, displaying humans as subjects that require entertainment as opposed to drivers keeping a watchful eye on technology, is rather too optimistic.

Before the machines that we call prototypes will be released onto the market they will encounter supervening social forces that will inevitably transform the prototype before it becomes an invention (Winston 6). Technology is thus not only formed in the hands of its inventors, but is also shaped by outside factors and social forces. This forces us to see how the supervening social necessities are appropriating and shaping the developments of in-car technology and will help decide how the future of automobility will look.

3.1.3 *Supervening Social Necessities*

In this third phase of modelling the processes of change in in-car technologies we discuss the supervening social necessities. As briefly touched upon in chapter two these are generalised forces that fuse together in order to function as a transforming agency (Winston 6). These forces influence the way in which prototypes are being brought into the world at large, moving them into the invention stage. According to Winston there is no limitation on the forces that can act as supervening social necessities (ibid.). They can range from new requirements of changed social circumstances to the subjective whims

2 United States. Dept. Of Transportation. Federal Aviation Administration. "SAFO Manual Flight Operations." FAA. Dept. Of Transportation, 1 Apr. 2013. Web. 8 Jun. 2013. <http://www.faa.gov/other_visit/aviation_industry/airline_operators/airline_safety/safo/all_safos/media/2013/SAFO13002.pdf>.

3 In the United Kingdom in 1930 the Royal Aircraft Establishment, nowadays the Defense Research Agency, developed what we today call an autopilot, but back then was called a pilots' assister, stressing the function of assistant rather then pilot. Even before this the Sperry Corporation introduced a rudimentary version of pilots' assister as early as 1912.

of perceived needs. I will focus here on the subjective whims of perceived needs from a driver's and a carmakers' perspective.

When attending the In-Vehicle-Infotainment Summit in London during my internship it became clear to me that there was a duality in the perspectives of carmakers when discussing smart and connected cars. On the one hand they felt a need to provide drivers with new technology in the car in order to keep youngsters from buying their products — as touched upon in the second chapter and voiced by Philippe Colliot of PSA Peugeot Citroën during the conference as he posed the question; how to answer to the Y generations' expectations? (Colliot 2012).

On the other hand the manufacturers sided with Mercedes-Benz' view of the car as a medium that could act as a direct communications gateway from the manufacturer towards their customers in general. According to Per Lindberg of the Volvo Cars IT Innovation Office this meant that manufacturers could start creating revenue by connecting the car, a development that was previously impossible (Lindberg 2012). The data that is generated by giving the customer convenience features like mobile apps will help manufacturers in strengthening the relationship with its customers to improve their core business; selling and servicing cars, an assertion that Lindberg clearly supports. By making the cars connected the manufacturer is at the same time connecting to the customer. Lindberg states that on average a customer will return seven times to an official dealership before switching to a no-name garage for their maintenance needs (2012). By making cars 'connected' it will provide bountiful possibilities for manufacturers and/or dealerships to reach out to their customers, increasing their grip long after the car has left the factory or dealer.

Opting for a customers' perspective one can argue that the newness of in-car technology helps satisfy the craving of early-adopters for having the latest technology, while the in-car technology fulfils essentially the same function as those filled by consumer technologies like the smartphone (Winston 7). The myth of being able to be more productive or free with these technologies becomes apparent as many car manufacturers block certain distracting features like social media appliances while driving in order to minimise distraction. This is not to say that manufacturers can ban the use of social media in the car as a whole, since smartphones are not (yet) fully regulated by in-car systems. This brings us to another important supervening social necessity. As smartphones are of yet more user friendly then in-car systems drivers might be tempted to reach for their mobile device even if it creates unsafe and, in most European countries, illegal situations.

Tom Wellings, User Experience and Design Research Specialist, argues that customers expect the same level of performance of in-car entertainment tools they are used to on their smartphones and exemplifies Cadillac's Cue system that does not have the same finger tracking as people are used to from consumer electronic manufacturers (Wellings 2012). Apart from having different regulations and technologies then consumer electronic manufacturers, most car manufacturers are infected with what Wellings calls *featuritis*; implementing scores of infotainment features in the vehicle that customers feel overwhelmed and are eventually irritated by the product. The case of featuritis shows the struggle of car manufacturers to come up with usable products that help them connect with especially young customers. Wellings shows that consultancy firm Deloitte found in their Annual Gen Y Automotive survey that "cockpit technology has emerged as a leading differentiator when considering and purchasing an automobile for young adult consumers" (2011). The immediacy — or rather social necessity — created by these surveys might influence manufacturers even more to jump on the infotainment bandwagon in order not to miss-out on cashing in on a new generation of consumers, and bring new convenience features to older generations. This enables them to simultaniously benefit of their customers' free labour for instance by automatically sending car usage data towards the manufacturer in order for them to enhance the product, much like we know from the software industry. This leads us to the next stage, invention, where one prototype prevails over all others and takes center stage.

3.1.4 *Invention*

The futuristic views of car technology as seen in the ideation phase were grounded in the belief that the future would be electronic. However, the drive towards miniaturisation of digital technology from the 1970s onwards, as discussed in the first chapter, has caused the futuristic topos of human car relationship to shift towards a future that is digital. A future where, amongst others, Mercedes-Benz sees the car as a medium. While I have argued that technological progress should not be seen as a linear path we can say that some of the dreams that were visible in the electronic future of the car have — to some extent — been materialised. One of the most prominent features of these early visions was the ability for the car to steer itself, be it called autopilot or a driverless car. Today, advanced driver assistance systems I previously introduced get close to these views of the past. Radar guided cruise control enables the car to brake, accelerate, and make small steering adjustments when a driver fails to do so. Moreover, sensors and cameras make it possible for even the lower segment of cars to have automatic parking assistants.[4]

4 It is however striking to see that a quick Google search on 'automatic parking' presents the suggestion 'did you mean automatic parking fail?', whereby the search

Figure 11: Graphic Control Center in Buick Riviera (1986)

Today most car manufacturers offer infotainment systems of one sort or another with essentially similar functionalities on entertainment, information and driver assistant features as discussed in the first chapter. Rather than discussing these systems evermore, I will debunk the myth of progress displayed by the car industry by introducing two subdevelopments of infotainment systems. I will fixate on an early touch-screen system and an early personal audio system to show how these inventions have failed to meet expectations, and met an early demise. In 1986 manufacturer Buick introduced the Graphic Control Center in their mid-range *Riviera* model. It was a built-in 3x4-inch cathode ray touchscreen for controlling the radio, climate control, checking the vehicle diagnostics and so forth (figure 4).

The system can be seen as the grandfather of infotainment systems, not due to its touchscreen control capability but mainly due to the wealth of information the system could display to the driver, as well as its prominent placement on the dashboard. Automotive journalist Brock Yates was quoted at the time having said that "there, mounted dead center, like a window on the future, is the magical, touch sensitive CRT screen, a.k.a. Graphic Control Center - the interface of an all-seeing, all-knowing computer that is meant to transform a trip to the 7-Eleven into a space odyssey" (Marlin). The so called space odyssey only lasted until 1990, when Buick decided to drop the system. However, already in 1987 Glen Zorpette, Executive Editor at the The Institute of Electrical and Electronics Engineers (IEEE), wrote that the touchscreen controller was perplexing and slow to sell (n. pag.). Another issue with the system was the lack of tactile feedback from the screen. This meant that to operate it, the driver had to take his eyes of the road which presented a safety hazard to the driver and other road users. In todays automotive environment, some twenty

giant unconsciously debunks the myth of technology as fool-proof, which is the way car manufacturers like to present them.


This RCA automatic record player provides motorists with up to two hours of continuous entertainment from 45-rpm records. Available as an accessory in 1960 Plymouth and DeSoto cars, it is the first automobile type to use readily available standard phonograph records.

Figure 12: In-car 45-rpm record player (1960)

years later, tactile feedback is still in its infancy. Moreover, from a safety aspect the time headway — the time it takes for a driver to operate in-car technology and focus on the road again — is nowadays strictly regulated by governmental organisations. In recent times car manufacturer Cadillac has however decided to push haptic feedback to market, featuring the first commercial implementation of this feedback technology as part of the infotainment system of their 2013 *XTS* model. When tapping a 'virtual' button on the touch-sensitive infotainment system, the user feels a little 'pulse' to acknowledge that that a button has been pressed, much like the resistance you will feel when pressing a normal button. However, due to the slow response of the system Caddilac's Vice President of Marketing Don Butler has stated to Wired that 'a hybrid approach – using both touchscreens and traditional knobs and dials – is in the cards for future vehicles" (Lavrinc).

Although Buick dropped the idea of the graphical control center, embedded screens are a common sight in modern day cars, but as Caddilac's example shows are still in prototype stage. It is important to remember that Winston also classifies an invention as malleable and thus regards it as a form of prototype. Both Caddilac's and Buick's system made it to the invention stage but especially in Buick's case the complexity of the product eventually led to its demise, in fact (re)turning it into the partial prototype phase. Another example of a failed invention is the introduction of the record player into the car by the Chrysler Corporation in 1960.

In a quest to tap into this personal music market they gave customers the option to embed a recordplayer in the car that played readily available 45 RPM records, promising "two hours of continous entertainment" (figure 5). The vibrations of the moving car however caused the record to skip and the only solution to enjoy the two hours of continuous entertainment was to listen to records while stationary. Due to the problems with vibrations and the sheer size of the record player the idea was eventually abandoned in favour of the 8-track system.

3.1.5 *Suppression of Radical Potential*

The shift from a prototype such as Mercedes-Benz' DICE vision discussed in the foregoing section towards an invention that will be implemented in cars that are brought to market is still some time off. Todays potentially distracting infotainment systems have caused governmental organisations to react, calling for a focus on driver safety. This has resulted in an increased interest on workload managers in automotive circles. In a recent survey the US National Highway Traffic Safety Administration (NHTSA) and the Department of Transport (DOT), two of the largest governmental organisations, found that in 2011 of a total of 13,350,953 drivers roughly 660,000 drivers were holding a cell phones to their ear, or manipulated other electronic devices while driving at any given daylight moment in the United States (Pickrell and Ye 2013: 7). With the car industry focussing on digital natives — or generation Y as used by PSA earlier — it is interesting to look at the use of these devices behind the wheel by digital natives as on average they are most likely to be entwined with new digital tools. In combination with a lack of driving experience this vulnerable group might benefit from a workload manager the most. According to the study "the percentage of drivers 16 to 24 visibly manipulating hand-held devices while driving increased significantly from 1.5 percent in 2010 to 3.7 percent in 2011" (Pickrell and Ye 2), even though the NHTSA has launched a program to combat driver distraction in 2009.[5]

The program launched by NHTSA did not only focus on achieving behavioural change of motorists, but also geared its attention towards car manufacturers calling upon them to enhance the safety of their systems. In 2012 NHTSA issued new distraction guidelines "to limit the distraction risk connected to electronic devices built into their vehicles, such as communications, entertainment and navigation devices".[6]However after a comment period, complaints on the strictness of the rules and pressure from car manufacturers meant

5 In 2013 the Dutch government launched a similar program called 'Tweetchatlikeanddrive' in order to show that social media and participating in traffic do not mix. "Aandacht op de weg." Rijksoverheid. Rijksoverheid, n.d. Web. 3 Nov. 2013. <http://www.rijksoverheid.nl/onderwerpen/campagnes/lopende-campagnes/aandacht-op-de-weg>.

6 United States. Dept. Of Transportation. National Highway Traffic Safety Administration. "Visual-Manual NHTSA Driver Distraction Guidelines For In-Vehicle

the guidelines were tuned down in favour of the manufacturers.[7] This shows that car manufacturers in turn suppress the radical potential that came into being at the hand of NHTSA. This is not to say that everyone in the car industry saw these strict guidelines as problematic. Before these guidelines were loosened under pressure of the car industry Tom Wellings saw them as an opportunity for brands to enhance their innovative reputations and, moreover, argued that safety should be paramount in the development of infotainment systems (Wellings 2012). According to Wellings it is critical for future HMI developments to differentiate between critical and non-critical driving related functions as he calls for context aware or real-time measurements of cognitive workload (ibid.). The invention of connected technologies by carmakers and subsequent guidelines for controlling their powers by lawmakers has forced manufacturers to develop a new technology, the workload manager. In the subsequent paragraph on diffusion I will examine the workings of the workload manager. For now I have shown that the radical potential is suppressed by both governmental as well as automotive institutions, albeit on different levels.

In 2014 BMW North America announced to make a range of its connectivity features under the ConnectedDrive label as standard for most of their 2014 models. When car manufacturers will offer connected functionality as standard — as BMW has done — car buyers do not have to consciously put this feature on their options list and consequently might be tempted to try the connected functionality of their vehicle, increasing the amount of road users that use electronic devices. It is clear that the answer to the paradox of using in-car media on one hand and road safety issues on the other hand cannot merely be resolved by adding more technology. As governmental organisations show, awareness campaigns might not be as effective as thought of but together with a tool like a workload manager it might be able to intervene and make the driver understand why a system impedes some of their actions, in order to shape their future behaviour.

While I have showed that NHTSA and other governmental agencies are leading in regulating and promoting safe car use, car manufacturers in turn influence them. Several carmakers themselves have started safe driving campaigns and as can be seen with the workload manager and are researching ways to make the use of in-car technology safer, but generally speaking they are a conservative industry.

Electronic Devices" NHTSA. Dept. Of Transportation, 2012. Web. 8 Jun. 2012. <http://www.nhtsa.gov/staticfiles/nti/distracted_driving /pdf/distracted_guidelines-FR_04232013.pdf>.

7 Cunningham, Wayne. "NHTSA Pulls Back from Driver Distraction Regulation". Cnet. CBS Interactive Inc., 23 Apr. 2013. Web. 30 Jun. 2013. <http://reviews.cnet.com/8301-13746_7-57581077-48/nhtsa-pulls-back-from-driver-distraction-regulation/>.

As with researching car advertisements opting for a historical perspective gives us insights to discuss if the car industry can really be typified as a passive industry. An appropriate example is the rise in usage of mobile phone behind the wheel and its subsequent regulation or banning of use at about the same time in several countries. The problem of driver distraction of using the mobile phone whilst driving was combatted with hands free systems. When these systems became mandatory around November 2001 in New York — the first state to ban cell phone use while driving a car — and followed or preceded by other countries and states following around the first part of the decade, there were already talks of banning mobile phones in cars for at least four years earlier.[8] In an article in Traffic Technology International from 1997 author Eddy Vanhoeke wrote that "in-vehicle applications of voice control technology are increasing, due to increased customer facilities and the prospects of new European and North American legislation, which is likely to ban hands-on telephony during driving" (n. pag.). This shows that car manufacturers themselves in this case were unable to regulate themselves and offer their customers a fitting alternative, as could be seen with the popularity of hands free solutions from companies outside the car industry such as Parrot. In hindsight we can say that hands free systems are actually partially failed inventions as the sheer distraction of having a conversation makes for unsafe driving. The distraction of talking to other people is in itself the cause of accidents (Pickrell and Ye). As it is unlikely that passengers will be banned from the car the drive for zero driver distraction can in effect be seen as a utopia on its own right.

At this point it should be made clear that car manufacturers are taking efforts to enhance road safety by running awareness campaigns on distracted driving and help educate young drivers by making them aware of the perils of driving a car while distracted. BMW ran a campaign in the United States that focused on the distraction of texting while driving. Competitor Ford focussed instead on educating teen drivers on the dangers of distraction with their Driving Skills for Life program, and Toyota has focused on teen girls and safe driving in their Arrive in Style campaign, as teen drivers are the most vulnerable and susceptible to distractions while driving as previously discussed.

Car manufacturers thus do think about informing (young) drivers of best practices and possible dangers of using technologies while

8 Carroll, Kelly. "New York first state to ban cell phone use while driving." Connected Planet. Penton Media, Inc., 27 Jun. 2001. Web. 14 Jun. 2012 <http://connectedplanetonline.com/news/telecom_new_york_first/>.
Note that each US state can produce its own legislation. As of 2013 it is still legal in Texas to use your cellphone while driving. "State Laws." Distraction.gov. NHTSA; Dept. of Transportation, n.d. Web. 16 Sept. 2013. <http://www.distraction.gov/content/get-the-facts/state-laws.html>.

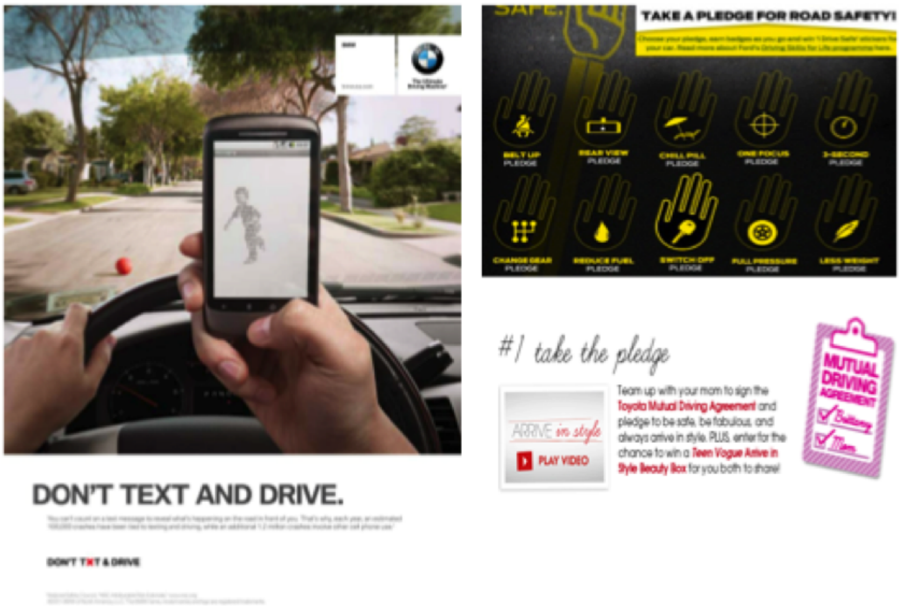

Figure 13: Print media of BMW, Ford and Toyota on safe driving

driving. It is however unclear if manufacturers started advertisements on safe driving in reaction to governmental guidelines. It is striking that in the case of the Toyota advertisement it is categorized under the tag 'philanthropy' by the Toyota USA press team.[9] This trade-off between delivering potentially distracting in-car entertainment to lure in customers, but at the same time promote driving safety is one of the biggest paradoxes carmakers face. This paradox brings us to the question if the industry can be typified as passive. As put forth one of the strategies of automakers is to negotiate and lobby with governmental agencies, as was exemplified with the example of the radio and the driver distraction guidelines. This makes it challenging to answer the question forthright. In the next step, diffusion, I will investigate how the technology of driver distraction systems is coupled with infotainment systems in order to enhance driver safety and use research of Telematics Update that interviewed decision makers on their visions of future in car technology developments.

3.1.6 *Diffusion*

In this section I will discuss the workload manager as a spin-off of infotainment systems. Winston defines spin-offs as products of technological performance synchronous or subsequent to the original device's diffusion (4). In this example the workload manager it is a

9 "Teen Vogue and Toyota Partner on Safe Driving Campaign to Help Educate and Empower Teenage Girls." Toyota USA Newsroom. Toyota, 4 Apr. 2013. Web. 28 Jun. 2013. <http://pressroom.toyota.com/releases/teen+vogue+toyota+partner+safe+driving+campaign+april4.htm>.

technological performance that was invented subsequent to infotainment systems to help control the amount of information flowing to the driver. The very existence of the workload manager is in itself part of previous developments of in-car media that forced manufacturers to come up with a solution to manage the drivers' workload. As research by German vehicle inspection company DEKRA in 2012 showed, many drivers do not understand the systems in their cars.[10] The result of these complicated systems is a heavier driver workload, as to operate them requires alot of driver effort, in turn sprouting the need for a workload manager, awareness campaigns et cetera.

Paul Green, research professor at the University of Michigan Transportation Research Institute, defines the workload manager as a system that collects a group of parameters in a car such as speed, location and active infotainment systems. Then, by interpreting that data, the system can estimate the drivers' workload or see if he is distracted (n. pag.). It is subsequently able to alter the availability of telematics and the operation of warning systems (ibid.). If for instance the drivers' workload is deemed to high it can intervene by disabling services, forcing the driver to focus on the driving task. Conversations with members of the automotive industry during my internship have pointed out that the ability to block incoming calls on difficult or busy stretches of road in order to control the workload is particularly popular. Not surprisingly the first versions of workload managers were focused on the mobile phone as the primary driving distractor (Green n. pag.), in todays world the in-car media landscape has expanded dramatically. A decade ago Green noted that there was a growing body of evidence that the use of telematics caused drivers to crash (ibid.).[11] While it is difficult to get a fixed number on the amount of cars sold with connectivity or in-vehicle infotainment systems we can see manufacturers speeding up adoption rates by providing these systems as standard in newer models. As discussed in the previous section, BMW decided to make ConnectedDrive standard for most 2014 models in North America, strengthening Greens observation that it is only a matter of time before Internet connectivity in cars becomes widespread (n. pag.).[12] As became apparent earlier, manufacturers see the car as a medium that helps them to connect to their

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10 Vögele-Ebering, Tilman. "Hightech im Auto für viele zu kompliziert." Dekra. Deutscher Kraftfahrzeug-Überwachungs-Verein, Apr. 2012. Web. 27 Dec. 2012. <http://www.dekra.com/de/dekrainfo?p_p_lifecycle=0&p_p_id=ArticleDisplay_WAR_ArticleDisplay&_ArticleDisplay_WAR_ArticleDisplay_articleID=14305131>.

11 Green notes that these distraction-related crashes surprisingly tend to be more likely during the daytime in good weather when conditions which are favorable to safe driving as opposed to bad weather or nighttime driving.

12 "BMW ConnectedDrive: Broaden Access and Expansion of Services Globally Will Include Benefits for U.S. Customers". BMW North America. BMW of North America, LLC, 18 Jun. 2013. Web. 2 Aug. 2013. <http://www.bmwusa.com/standard/content/experience/newsfeed/post/2013/06/18/BMW-ConnectedDrive.aspx>.

customers. As a result telematics have been at the top of the agenda of the automotive industry. This view is substantiated by research from Telematics Update in their Automotive HMI 2013 report. In-depth interviews with industry experts and an online questionnaire show that across three car segments — premium, mid and low-end — location based services are deemed the most important (appendix 9). The research conducted by Telematics Update also incorporated the perceived importance of workload managers. This is a striking result, as the research of Green shows that a workload manager is can help to reduce distraction based crashes. In comparison to Green's work, the reserarch by Telematics Update shows that workload managers are not seen as an important development by the car industry, noting that "workload management systems are not seen as an important solution (average scores = 3.4, 3.0, and 2.6, respectively) and are low down the feature ranking, despite the need to manage the amount of information given to drivers. They are considered positively unimportant for low-end cars" (appendix 9). It is striking to see that the focus of manufacturers — after the NHTSA have presented their strict guidelines — still lies on providing extra services to the customer instead of trying to manage driver distraction. When comparing the example of the restriction of mobile phone usage whilst driving it seems that with the workload manager a same passive stance of the industry is discernible. Later on I will use patent filings to show that companies other than car manufacturers are working on workload managers, who might in time eat away at the car manufacturers profits as Parrot did earlier with hands free systems.

As aforementioned there are four different classes of prototypes according to Winston, which I will discuss here in regard to the workload manager that came to life at the hands of the law of suppression of radical potential. The first class is that of a rejected prototype, meaning that no use for the device is seen. Secondly there is the accepted prototype, which partially fills an incomplete operation of a supervening necessity. Thirdly there is the parallel prototype where the device in question already solves another technological problem. The fourth and last class is the partial prototype, one that fails to live up to expectations and do not perform as well as expected. Winston sets forth that "except for partial prototypes which simply did not work very well, the other three classes of prototype all work, more rather than less" (8).

In the case of the workload manager we can see the prototype as a mix between partial and accepted. As discussed there is a need for workload managers to reduce telematics induced crashes, thus this prototype can be seen as an accepted idea. However it is partial as there is not yet one prevailing type of workload manager over the other, judging by the amount of intellectual property and patent fillings. While there was much discussion between car manufacturers on combining research efforts and forming alliances with each other during the in-vehicle infotainment summit in London, at the time of writing this baseline system from where a manufacturer can develop its own generic system has not prevailed. Thus the invention is stuck on a partial technical prototype. As it is a new-to-the-world product the workload manager cannot be seen as a parallel prototype either.

While car companies publish future visions they hardly — if ever — publicise detailed information of their research and development efforts. The best places to gain insights into these developments are patent and intellectual property databases. These databases are a valuable source of information on upcoming developments and give a general idea as to where companies are focusing their R&D developments. On investigating patents of workload managers during my internship I found that many car manufacturers have patented this development in some sort or another, corroborating Winston's account of synchronous development. As I do not intend on discussing these systems in detail I have included the patent overview in the appendix nr 10. The patents clearly have different technology characteristics in order for the rights to be granted, the key differences take place in the parameters and readouts on which the system is bound to act.

As shown previously with the example of car radios and hands free systems being fitted as aftermarket products or the advertisement of driverless cars being promoted by power companies other actants then the car industry produce prototypes that work within the confines of the car. When combing trough databases for patents relating to workload managers I found that similarly to previous examples actants other than the car industry had filed such patents. One company has been featured in the example of car radios, namely Panasonic. The other two are Continental, originally a tire manufacturer and Autoliv, originally a car and tractor repair shop. These three companies from a diverse background are in part focusing on in-car technology such as the workload manager showing that spin-offs from a device's original diffusion does not need to be invented by the company that envisioned the original product. It should be clear that carmakers make extensive use of 3rd party suppliers to build their cars but it is equally true that firms who apply for patents are most likely doing so in order to root out the competition. MIT professors in Marketing and and Management, Glen Urban and John Hauser, explain this phenomenon from a monetary perspective. According to them the stream of patents can be linked to the relatively low cost of generating several potential ideas compared to the cost of actually implementing any one idea (Urban and Hauser qtd. in Reid and De Brentani 172).

In other words, the ideation phase — which diffused products inevitably pass trough —is a hotbed of technological patents in order to secure an invention. From a strategic perspective patent filings can be used to deceive the competition into pouring valuable research and development funds in a dead end wasting both time and money in the process. While most inventions do not make it to the final product stage it is important to introduce new-to-the-world products because when successful they pay off more than proportionally (Reid and De Brentani 172). In order to profit truly from these a new technology like the workload manager without spending vast amounts of their wealth on patents, car manufacturers will have to become more active and lean to adapt to changing demands of customers and lawmakers alike.

3.2 THE CAR AS MEDIATOR IN HUMAN TECHNOLOGY RELATIONS

Before we dive into the constitution of the car as a smart environment and explore the key actors responsible for this, we have to first have to explore the different relationships that exist between humans and technology to see on what levels humans and technology interact. As Verbeek states, humans no longer autonomously shape the world they live in but they do so in relation with technology (2011.: 119). Verbeek links Don Ihde, Historian and Professor of Philosophy at Stony Brook University with Bruno Latour's actor-network theory. In his book Technology and the Lifeworld (1990) Ihde has defined four basic relations how humans relate to their lifeworld using technology namely *embodiment relations*, *hermeneutic relations*, *alterity relations* and b*ackground relations* (72). These relations go beyond the object-subject dichotomy and try to understand the underlying relations between humans and technology. I will show that all of these relations are existent — some more clearly than others — in the network that is a modern day car which in itself is an assembly of technological parts. Where Winston's model helps to show the different forces at play where humans and technology meet, the four relations defined by Ihde help to unearth and examine the different levels on which humans interact with technological artefacts. By adding this perspective to the information unearthed in Winston's model I will be able to portray both the social and technical elements when exploring the car as smart environment.

The first relation Ihde discusses is the embodiment relation. In this relation technology fades to the background, away from our perceptual awareness (Ihde 72). In the case of the car the windscreen is a technology that helps keep wind and debris out of the car while simultaneously providing the inhabitants with a screen trough which to see the outside world. While the windscreen is clearly visible to the outside world, the driver looks 'trough' it to perceive his surroundings. In this embodiment relation the technology literally is transparent to its user, much the same as (sun)glasses to its wearer.

The second relation is the hermeneutic relation. It requires an interpretive action within the technological context that call for special modes of action and perception (Ihde 80). If we take the example of the car, the driver can look trough the windscreen and assess, to a certain extent, the speed he or she is driving at. However, to have a more accurate reading of his speed, the driver has to rely on on-board equipment like the speedometer and combine this with his own perceptions to create a partial symbiosis and make the technology perceptually transparent (Ihde 86). The distinction between embodiment and hermeneutic relations is that in the first relation the driver can see out of the window and instantly make an educated guess on his driving speed. In the second relation the driver has to look at the speedometer, becoming aware of it, and then make an interpretative leap by looking trough the windscreen. The driver thus has to blend the information from his instrument panel with his own perception by looking outside to see if either is correct. This makes it possible for the driver to see if the technology — a speedometer in this example — is in working order. Sociologist Tim Dant corroborates this view by saying that "the driver's sense of how fast they are going and what speed the road conditions will permit, becomes a skill embodied through the vehicle, not only its dials and controls but also its sounds and vibrations" (71).

Alterity relations are relations people have *to* or *with* technology (Ihde 97), and are most visible in the car with technologies that steer us and require our permanent attention such as in-car navigation. Professors of Human Computer Interaction at the University of Strathclyde, Trevor Hogan and Eva Hornecker, write that once programmed the navigation system becomes the centre of attention, a quasi other, to which we relate by obeying intelligent directions verbalised by the device (n. pag.). Everybody knows stories of drivers mindlessly obeying the instructions spoken by the trustworthy human voice of the satellite navigation, and ending up in places or even countries where they initially had not meant to end up.[13] When such a situation occurs — regardless if it is a driver or technological error — the trust relation between the driver and the quasi other is broken, resulting in frustration or even rage (Hogan and Hornecker n. pag.). Sociologist Les Back and Musicologist Michael Bull support the view of Hogan and Hornecker by affirming the contradictory nature of the driver who is simultaneously all-powerful as well as controlled, not only by the technology of the automobile but by other drivers and the road system as well (Bull and Back 358).

The last relation in the human-technology lifeworld is the background relation (Ihde 108). Technologies in a background role are not part of the focal attention but nevertheless condition the context in which the inhabitants live. An automotive example is the aircondi-

13 One of the most striking examples is a Belgian woman who, instead of driving to Brusels, drove some 900 miles to Zagreb, Croatia.
Krumboltz, Mike. "Woman Drives 900 Miles out of Her Way after GPS Error." Yahoo News. N. p., 15 Jan. 2013. Web. 7 Apr. 2014.

tioning that automatically adjusts the temperature inside the cabin. These technological functions are barely detectible to the human ear and form a background or ambient noise that disseminates in the background.

However, the most fruitful relation to pursue when investigating the car as a smart environment is the embodiment relation as it enables us most clearly to investigate the relation formed by technology and humans in the car. As aforementioned, Marshall McLuhan opts for a technological deterministic view of the car and sees it as an extension of man, amongst others enabling us to travel further and faster. In order not to lapse in the technological determinist perspective it is essential to note that we are not only driving the car, but we meanwhile form a relationship towards the car, the road system and other road users as well, as previously argued by Bull and Back. The car as a smart environment is thus active beyond its metal shape and as several actors, both technical and social, work together in making it a reality.[14] I will use this relation in the following paragraphs to show these human-technology and technology-human relations. A second fruitful relation to see how the car as a smart environment is constructed is the alterity relation. As shown in the examples of the Philips car radio and early satellite navigation systems the technology is referred to as 'the other' and is presented as a passenger in the car. Both the embodiment and alterity relations as exemplified above are blurring the boundaries between what we see as social and what we see as technical in the automotive realm. In the next paragraph I will discuss the future of in-vehicle infotainment by discussing the bring your own device trend fuelled by technological companies that enter the car market; Google, Apple and Microsoft.

3.3 THE FUTURE OF IN-VEHICLE INFOTAINMENT

My discourse analysis of the infotainment landscape and media use in the car has thus far focussed on debunking the myths of progress and showing how manufacturers, in their mission to connect their customers with the outside world, revert to using old topoi that show that inhabiting the space of the car does not have to be limited to the driving task. It is clear that the discourse of the car as a smart environment has changed little. The utopian future presented by carmakers over the past decades has still not materialised and it is likely that it will be still some time off until driverless cars become a common

14 On a side note, in 1940 Norman Bel Geddes envisioned the road of the future being designed without governmental organisations in the network of influence. As shown in chapter 2 governmental organisations still play a role in road safety. He wrote; "Everything will be designed by engineering, not by legislation, not in piecemeal fashion, but as a complete job. The two, the car and the road, are both essential to the realization of automatic safety. It is a job that must be done by motorcar manufacturers and road builders cooperatively" (Geddes 56)

sight on public roads. By deconstructing the car as a smart environment and debunking the myths and rhetorics used by the car industry I have unearthed a network of actants that play a role in the formation and realisation of this futuristic world of tomorrow. That the vision of carmakers can be typified as at the least optimistic is not to say that there is no development in the field of automotive entertainment and subsequent creation of the car as a smart environment. Rather, the last decade has sprouted a series of alliances of carmakers, consumer electronics producers and suppliers in bringing media content into the car. As a lot of recent developments find their foundations in the Internet, the development of infotainment systems brings about similar discussions of privacy and free labour.

As I have shown manufacturers explicitly focus on making their car more connected, not only to lock-in a younger target audience who are raised in a connected world, but to enhance their own services as well. By functioning as a gatekeeper carmakers will find themselves in a new field that has yet to fully materialise. Here they find resistance of governmental organisations and users that suppress the radical potential of their technologies as notions of safety or privacy are under constant pressure of these manufacturers and their partners. Much in the way as miniaturisation of computing power was lead by newcomers in the market the real for providing in-car entertainment is being lead by newcomers in the automotive field, most notably Google, Apple and Microsoft. In an effort to lock users into their respective ecosystem a new clash of these titans emerges.

3.3.1 *Bring your own device trend*

A point that stands out when researching the history of car infotainment is that the car industry is trying to innovate but it is struggling to deliver true convenience to their customers who already carry large parts of their life with them in their phones. Being aware of this pitfall consumer electronics manufacturers are stepping into the arena to bring the media landscape into the car. During my research conducted at the time of my internship I found that in the In-Vehicle-Infotainment Summit several alliances between companies like Nokia and carmakers were presented. Here a similar discussion from the software paradigm emerged; to go the direction of open source of closed source in-vehicle infotainment platforms. According to Head of Connected Car at Kia, Henry Bzeih, opting for bring your own device (BYOD) systems will result in a 50% decrease in infotainment cost (Bzeih 2012). He does acknowledge that serious issues might arise with BYOD technology, as there are a great variety of systems that need to operate within the vehicle (ibid.) However, large technology corporations that are trying to enter the car-market facilitate the current BYOD trend. As Geier et al. contends this shift was bound to happen as our mobile phones are the ultimate nomadic personal devices filled with our data and, moreover, are capable of delivering some impressive computing power (n. pag.).

In an enduring effort to lock users into their ecosystems, the battleground of players in the mobile phone arena, and especially the clash between iOS and Android, has recently shifted to the car. As of 2014 Apple introduced *CarPlay* as a way to incorporate this data and power into the confines of the car. According to the manufacturer it is designed as 'a smarter, safer way to use your iPhone in the car. Just plug in your iPhone and go'. While Apple has a relatively small array of phone models, its iOS operating system is closed source. By releasing software development kits (SDKs) a lively open source community is based on the iOS platform, with large corporations such as Facebook contributing to it. This means that there is some flexibility for developers and carmakers within the system, but they cannot control the implementation to the full extent. As opposed to this closed system Google launched their *Open Automotive Alliance* (OAA), geared towards bringing their Android platform to cars in 2014. However, as Henry Bzeih again rightly notes, as opposed to iOS there are significant differences between hard- and software but the software itself is open source affording car manufacturers more freedom (Bzeih 2012).

In answering the question why a system based on existing telephone technology is beneficial to manufacturers the alliance writes "automakers will be able to leverage a platform already being used by millions to deliver a familiar and consistent experience to their customers." This yet again reinstates the goal of tech companies such as Google, Apple and Microsoft, to lock users into their ecosystems. When looking at the user interface design of these systems in figure 14 and 15 this statement has materialised in familiar designs that users of the relevant systems will have little problems using from the get-go.

An area where BYOD systems can make an impact that is as of yet impossible is extending the lifespan of an entertainment system. Currently there is a mismatch in the rate at which consumer technologies change, and in which the car industry presents new models. A typical phone has a lifespan of around half a year after which a new or updated variant will be teased or released. Carmakers on the other hand present a car that will be sold for about six years, with a facelift during half of its lifespan. Making the in-car technology scalable by tapping into the power of frequently updated smartphones makes for a friendlier in-car media landscape. As the car manufacturer only has to focus on implementing a proper touch-screen and the architecture needed to link the phone to the car slow and unusable systems as the Graphic Control Center in the Buick Riviera will most likely be a thing of the past, on the note that compatibility — next to safety

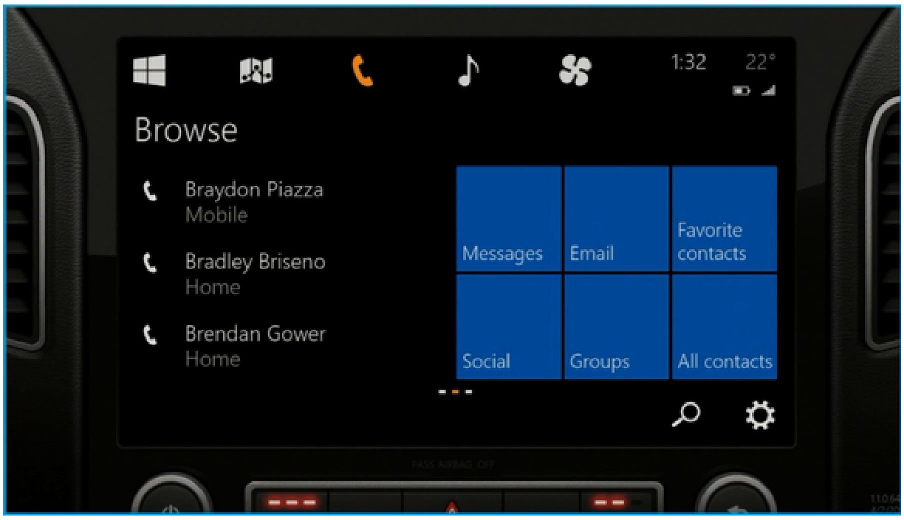

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Figure 14: Microsofts efforts to bring their Windows embedded ecosystem to the car (2014)

Figure 15: Apple's Carplay system powered by iOS (2014)

— is top of mind in the industry. Phones that are compatible to a certain extent with older systems will provide them with a necessary speed upgrade and thereby extend their life. Ferrari has claimed that they will launch an aftermarket module to provide last-generation infotainment compatible with most recent phones for its older vehicles dating back to the F355 that first saw production in 1994.[15]

3.3.1.1 *Shifting human technology assemblage*

It is safe to say that these developments are but scratching the surface of the merging of our cars with our nomadic devices. This merging of two technologies what until some time ago were relatively unrelated will result in a shift in how we can see human and technology relations in regard to the car. While the metaphor of the cyborg is usable when looking at human technology relations within the confines of the body as shown in section 2.3 it is less fitting in human technology relations that is habitable such as the car, as it is not a permanent assemblage.

In researching the assemblage between the driver and the car from a phenomenological perspective similar to Don Ihde, Tim Dant, sociologist at Lancaster University found that it is can be seen as a form of social being that produces a wide range of social actions such as communication and transportation (61-62). Dant found that the usage of the term cyborg as a way to explore the relation between humans and technology tends to fix and reify the assemblage (62). Another term that is frequently used to refer to an assemblage of both human and technological forms is the word *hybrid*, as briefly discussed in chapter 2. Dant argues that similar to the term *cyborg* the word *hybrid* is not useful to talk about the technology and driver assemblage, due to the fact that it refers to the offspring "of two species that are usually unable to reproduce whereas the driver-car is an assemblage that comes apart when the driver leaves the vehicle and which can be endlessly re-formed, or re-assembled given the availability of the component cars and drivers" (ibid.). Using the terms *cyborg* or *hybrid* will thus obstruct the fact that the human and technology are not permanently conjoined within the confines of the car, but are part of a temporal assembly. I side with Dant and agree that it would be better to talk about the *driver-car*; a temporal assemblage that affords actions that neither the (human) driver nor the car could establish on its own (62).

However, when looking at the BYOD trend we have to yet again adjust our notion of the human-technology assemblage that is being brought to life in the *driver-car*. The efforts of manufacturers to make the mobile device an integral part of the infotainment system means that the assemblage of the driver-car is stretched outside of its orig-

15 "Volvo and Ferrari: Their Plans to Bring CarPlay to Older Vehicles." Apple Toolbox. Web. 13 Apr. 2014.

inal context as the mobile phone acts as an agent that stretches the influence of the car outside the temporal driver-car assembly. Controlling features of the car by using a mobile application is a popular feature implemented by most large carmakers nowadays. They even use similar wording to emphasise the connected nature of their systems with BMW calling their system *ConnectedDrive*, Volvo naming it *Sensus Connected Touch*, Audi choosing *Connect* and Mercedes-Benz opting for the much revealing name *Mbrace*. These systems reach out, extending beyond their original sphere of influence, and tempt the user to embrace them in their daily routine by connecting to his or her smartphone. The pervasive power stretching beyond the cars' confines means we have to take BMW's tagline — as introduced in the first chapter — S*o connected you're free*, quite literal. These 'always on' connections make it ever more important for car manufacturers to reflect on the safety of their vehicles both from a distraction and a security perspective as the technology in itself has agency which when not taken into regard, might leave customers with a feeling of unruly technology.

3.3.1.2 *Controlling the driver-car*

The concept that technology has agency is hardly discussed in popular culture, and technological determinism displayed by car manufacturers reinforces the myth of the driver as being always in total control and technology only playing an active role when the driver consciously asks for it. As the term *driver-car* already indicates, both humans and technology have agency. The perceived autonomy of humans over technology as displayed in popular culture is not as large as we have been lead to believe since the Age of Enlightenment according to Peter Paul Verbeek (2011.: 84). He asserts that technologies help shape our actions and decision-making efforts, thus influencing our presumed autonomy and actorship to a high degree (ibid.). It is safe to say that the view most of us have of ourselves as autonomous beings using technology as an end is challenged. This means a new lexicon is needed to understand the changes that are taking place. In the case of the automobile that is gradually transforming into a medium the *driver-car* might be a start of this lexicon. It can be seen as a rational argument to disregard the interwovenness of humans to technology, as we feel threatened by technological developments interfering or blurring with our lives. The rise and subsequent spread of pervasive computing and ambient intelligence by both the system of the car and the drivers' smartphone makes it ever more difficult to talk about autonomous beings. It might therefore appear as if we have to give up the things that make us human; the autonomy and freedom to design our lives the way we want it (Verbeek 2011.: 44).

When approaching the human technology relations of Ihde from an ethical perspective a tension is visible between the alterity relation and the feeling of losing control over technology as I will discuss later on in regard to workload managers. People do not like the feeling that technology is making decisions on their behalf and will try and suppress the radical potential of technologies, meaning that car manufacturers have to prepare drivers to get entrusted with systems to take decisions for them. This feeling of losing grip might be one of the factors that suppress the introduction of the driverless car for so many decades. Having a feeling of control over technology is vital and as such I do not foresee driverless cars — mimicking the horseless carriages of days gone by — appearing in the near future as described by popular media and shown throughout this thesis. From a different perspective the merging of the smartphone and the car can also be seen to diminish the feeling of loosing control, as drivers only have to fathom ecosystem such as iOS or Android, which is easier then trying to comprehend the working of multiple systems. The strive towards standardisation will not only make it easier for us to adapt to these technologies, but also make the job of policymakers and governmental institutions simpler as they have a less varied infotainment landscape to study which subsequently makes it easier for them to suppress the radical potential of certain features or systems by issuing generalised governing laws. Developers of these systems and laws lawmakers alike need to keep in mind that these systems might enhance the feeling of insecurity and fleeting sense of autonomy of drivers, especially when the trend of merging the car and the phone into one ecosystem progresses and will encompass location-based information.

3.3.2 *Location based information trend*

In their efforts to turn the car into a media system by tapping into existing structures, the embodied mobile phone enables carmakers to tap into the life world of its customers. As the smartphone enables the car to extend its reach beyond the confines of the car it becomes part of the embodiment relationship and gains access — to a certain extent — to the personal sphere of the driver. By connecting the car a vast world of information becomes available to the driver even when he or she is not driving nor near the car. At the same time car manufacturers become gatekeepers of a vast fleet of connected cars that will prove to be a valuable asset for them as long as they figure out a way to safely provide their customers with content. As discussed earlier innovations in this field will most likely sprout from the efforts of consumer electronics manufacturers like Apple, Microsoft and Google as they have already gained a spectacular lead over car manufacturers in providing (mobile) clients with vast amounts of data. As shown in the previous section car manufacturers are forming alliances with these companies and some products have been moved up from the prototype into the invention phase.

Cars of today are already using location-based information. This information can be used to enhance the drivers' infotainment system, but in another role can help the car to intelligently respond to its environment. In their latest model the Wraith Rolls Royce uses the cars' location to enhance ride quality by predicting the road ahead and automatically choosing the right gear to deliver power without any unnecessary gear changes, providing the smoothest ride possible.[16] This system works without any intervention from the driver and the driver might very well be oblivious to this system working for him.

This brings us to other ways in which car manufacturers can use location-based information to benefit the driver or themselves. Firstly there is the usage of location-based data to enhance the features of the infotainment system. This became apparent in the DICE system of Mercedes-Benz where the car can intelligently respond to its environment as it has a form of situational awareness. This development builds on earlier prototypes that featured augmented reality windscreens. In their 2020 Autoglass vision, vehicle glass and repair shop Autoglass shows a car driving trough London fitted with an augmented reality windscreen.[17] While less advanced than the prototype of Mercedes-Benz it displays a similar vision; as the driver makes his way trough the city information about sights, advertisements of local shops and warnings of pedestrians and cyclists are highlighted on the windscreen. While these future outlooks are as of yet too distracting to be brought to market these prototypes do signify that the automotive industry is looking towards the enhancement of the windscreen with location-based technologies. Another possible use of location-based information that is less futuristic can be found in the realm of in-car audio. Streaming music services such as Spotify know which songs are popular in which regions it may provide for the perfect holiday playlist based on the position of the car, or the perfect playlist to brighten your day based on the current weather.[18]

However as must be clear from this thesis, technology not only benefits its user but also its creator. As such, location based information trend will not only benefit the driver. Another way in which location based information might be used, as Colliot stated in 4.1.3, is to benefit the carmaker. Recently it came to light that BMW uses information

16 Rolls Roys calls this system Satellite Aided Transmission and at the time of writing is only available on the *Wraith* model introduced in 2013.
"What's new? Rolls Royce Wraith SAT." Automotive Testing Technology International. Web. 13 Apr. 2014

17 "Autoglass 2020 vision: the future of the car windscreen." Autoglass News. Web. 23 Mar 2014.

18 An app that currently works on the Spotify playform called *Tunaspot* already works with location-based playlists.

gathered by on-board systems to analyse driving behaviour.[19] Based on this information the carmaker can advice the driver on the technical state of his car, and when amassing large quantities of data enables the manufacturer to gain insights in the usage of their cars and provide them with insights for possible improvements. While this information gathering is being considered a service by the manufacturer privacy issues to arise as the car owners does not know what data is collected, and he is unable to disconnect his connected car. Manufacturers should be forthright which information they collect and to what goal, in order to build a relationship based on trust instead of mistrust. Volkswagen CEO Martin Winterkorn endorses this view by calling for a privacy alliance during the 2014 CeBIT conference. According to Winterkorn the protection of user data in networked vehicles is of great importance for manufacturers as they strive to connect their vehicles.[20] I believe that this call from Winterkorn is a much needed first step before carmakers are really able to tap into the power of location data. If manufacturers want drivers to use their systems and simultaneously help them gain insights in the usage of their products transparency is key. Embedding location-based information and following the BYOD trend cars in the near future will be able to respond intelligently to its environment. This means they themselves turn into a persuasive and smart environment. In order to cope with these vast flows of information it is safe to say that some sort of manager is needed to handle this flow of information.

3.3.2.1 *Handling information flows*

On the 5th of April 2013 the New York Times featured an article on driver workload with the ironic title; *As Workload Overwhelms, Cars Are Set to Intervene* (Stenquist). According to the article a flood of distractions are invading automobiles as engineers are dreaming up a new generation of infotainment systems. As I have already discussed the operation of the workload manager I will focus on the way location-based information creates an status quo where a system is needed to counteract impulses such as location based information to the driver, and location based information might benefit the workload manager to better intervene in the processes of infotainment as it might help to make a good estimate on the potential workload of the driver and allows it to act thereupon accordingly. It must be clear that in-car technologies that once operated as standalone systems are now being combined to work together, in effect creating an evermore smart environment within — and by adding the smartphone to the loop outside of — the car.

19 "NSA lässt Grüßen: BMW ruft Fahrzeugdaten heimlich ab." Deutscher Presse Pool. Web. 13 Feb. 2014

20 "Cebit: VW-Chef Martin Winterkorn warnt vor Auto als "Datenkrake"" Spiegel Online. Web. 12 Apr. 2014

Paraphrasing Verbeek we can say that technology gives direction to people's actions and experiences by mediating in the relationship between human and reality (2009.: 235). This is especially the case when systems work together to create a smart environment. It should be noted that these smart environments not always react in a correct manner and, as we humans become habitually embodied in the driver-car, automatic processes might unknowingly act or intervene hidden from the drivers sight or input, which can especially become an issue when the driver is faced with a car other than his own. Microsoft wants to make their system intelligent so that the system learns the functionalities you use most, and place these in the most logical places. They furthermore say that it will not necessarily replace the co-pilot but can enhance the co-pilot with functionalities. According to John Hendricks, Creative Director of Connected Car at Microsoft "the system can act as a sort of social lubricant inside the vehicle".[21] Hereby they are reaffirming the belief that technological- and car companies alike hold that technology is the only aspect that needs changing in the world of tomorrow.

The formation of these intelligent systems, to which I include the workload manager, will show us overtime how we will respond to this kind of technology inside our cars. Today it poses questions of responsibility as these systems that demand and afford attention are being brought to market by carmakers and tech companies. When introducing its City Safety System — the brand name for its driver assistant systems — to the press, the image of carmaker Volvo as being the safest on the market was quite literally dented. Much in the way as Microsoft presents its system Volvo's City Safety System functions as a co-pilot, scanning the road ahead for obstructions and alerting the driver to take action. Besides functioning as a co-pilot it can assume the role of pilot and is able to automatically brake below speeds of 40 kilometres an hour if the driver fails to react to a situation the system sees as dangerous. In presenting this last feature to the press the car crashed into the back of a parked lorry while the system should have prevented the crash.[22] While this crash occurred in a closed test environment it does raise an interesting question; who is to blame in the event of a crash? In this case several actors can be distinguished. First there is the driver. It is his or her responsibility to guide the vehicle trough traffic, spot dangerous situations and act accordingly. The second is the manufacturer or party that sells the system, in this case Volvo. When launching a product it is their responsibility to make sure it is thoroughly tested and works as advertised. As I argued throughout this thesis we must however not forget

21 Designing the Future of the Intelligent Car: The Driving Experience. Windowsembedded., 2013. Film.

22 Gunar1234. "EPIC VOLVO FAIL (with comment from representative)." YouTube. YouTube, 7 May 2010. Web. 10 Apr. 2012. <https://www.youtube.com/watch?v=jClxcSBNwcw>

that the system is built by humans, and can just as likely as the driver of a vehicle make an error. Another actors can be found in the realm of governmental agencies such as the Department of Transport (DOT) and legislators such as NHTSA. They have an obligation towards society to pose guidelines for the development of these smart systems that ensure safe road conditions for all road users. As discussed in the prototyping section of this chapter ,it must be clear that these systems are in fact assistant systems, much like the example of the autopilot in airplanes. To illustrate this example I refer to Norman Bel Geddes who, back in 1940, wrote that "it is ridiculous, for example, to pass a law saying that when one driver meets another car he must dim his lights, when this action can be achieved by mechanical means independent of the driver" (Geddes 58). This sounds like a reasonable, and quite brainy remark of Bel Geddes. In practise this means that a previously conscious action, turning on the lights when conditions require it, is being relinquished to technology. Today, with automatic lighting systems in place we can see the pitfalls of this technology. After spotting several cars driving without lighting in foggy conditions the Dutch Police advises motorists to disable automatic lighting and revert to manual control.[23] This example exposes a challenge and subsequent responsibility for car manufacturers. In their endeavour to show smart their cars really are they are neglecting the role of the human and focus solely on the technology. It appears that to their eyes, the assemblage of the *driver-car* is still just *a car*.

Green, who wrote the first set of U.S. DOT telematics guidelines, discusses the issue of responsibility in the case of the workload manager in the United States and found that "although it is ultimately the driver's decision when to use telematics devices, legally, responsibility for driver safety is shared by many, including OEMs and suppliers, under the principle of strict liability (n. pag.). This means that manufacturers cannot simply blame drivers for incompetence in the case of a crash, but that ideally they educate their customers on the workings and especially limits of their smart cars. From this viewpoint the workload manager brings us in the strange situation where a system that actually affords drivers to shift responsibility to technology, as it is designed to keep them safe, might actually have an adverse effect in creating safer road conditions. According to the Telematics Update research, car manufacturers rather focus on taping into our social spheres by promising to enclose our family and friends in the car using social networks rather then developing a workload manager. By reinforcing these social ties manufacturers have to take into account that when driving, humans do not think about the technology that is requiring our attention — as shown in Ihde's alterity relation — but instead focus on the sender, which might be our family or friends. As

23 "Licht niet op automatisch bij mist." Politie. Korps Landelijke Politie Diensten, 16 Nov. 2012. Web. 17 Dec. 2012.

Green argues on mobile phone distraction, we are conditioned in a Pavlov like manner to respond to the ringing that even when talking to the President of the United States we would respond by picking up the phone (n. pag.). This behaviour is so ingrained into our behaviour that Green says it is "extremely unlikely that any amount of public awareness, education, or training will alter that highly reinforced behaviour" (n. pag.). In examples throughout this thesis the steering role of technology is apparent and shows that to ignore the technology by focussing purely on the social, is to ignore the persuasive powers technology can hold.

The explorations of Mercedes-Benz' DICE system or BMWs ConnectedDrive make it apparent that technology tries to taps into the circle of trust between family and friends which might enforce its distracting power since to ignore the system is to ignore a possible collocutor. As a result solutions like the workload manager are required to regulate these distractions. Eliminating the human factor, as Geddes suggested, does not help us further understand the network of the driver-car. Its never purely technology or purely human that acts. Verbeek calls for the need of an ethics that does not position against technology [or humans for that matter], instead it should critically accompany the development of technology (2011.: 30). These new technologies give us new or even unparalleled possibilities to which we humans can subject ourselves. We should be aware of these developments and ask the question how to best cope with these new relations in an age where the car is increasingly smart and being intertwined with our life world. As sketched in this thesis the first steps have been made, amongst others with the debunking of the myth of linear technological progress and the thought of developing a new critical vocabulary, starting by calling the human-technology assembly we call the car a driver-car.

4 CONCLUSION

If one thing stands out from this thesis it must be that carmakers are searching for ways to prepare their cars for the world of tomorrow, embedding their use into the digitised lifeworld of the driver. By positioning the car as a medium they try to create an ecosystem where not only the driver is connected to the digital world within the confines of the car — using new media tools such as smartphone apps and social networking sites — but simultaneously try to extend the reach of the car beyond its physical metal shape. The inherent two way flow of digital communication means that manufacturers not only extend the digital world into the car, but also the car into the digital world. To do so manufacturers make extensive use of media rhetoric and topoi that enable them to show the endless possibilities of the car as a smart environment. The appropriation of this problem solving power borrowed from the information revolution come however with their consequences as I have shown. By using these topoi they simultaneously invite the (new) media paradigms that in this case the tapping into popular media rhetorics and myths brings on questions on ethics and privacy, which media scholars know all to well.

It is important for manufacturers to realise that the myths of the information revolution they use in the promotion of their products plays a big role within their companies as well. New business models that see the car as a medium are being presented by — and within — the industry as the next big thing, with digital technologies giving endless possibilities for them to transform the car into a smart environment, chasing the utopian future they themselves created in the mind of the public with their advertisements. Using historical discourse analysis I was able to show how popular media rhetoric is appropriated by the car industry in their strive to present the 'latest and greatest' over several decades. It has become apparent that myths play an active role in the construction and materialisation of the car as a smart environment. In their efforts present — and uphold — a futuristic and progressive image carmakers resort to using topoi known from the information technology sector, appropriating myths of freedom and linear technological development that are enabling them to sketch a world, or rather car, where fictitious barriers of yesteryear are broken down and (technological) possibilities seem sheer endless.

The media texts I uncovered and subsequently analysed during my archive research made it clear that carmakers have historically been fervent supporters of the myth of linear technological development.

However, by introducing and applying Winston's model of technological change I was able to debunk this myth of linear technological progress that is firmly embedded within the automotive industry. I have shown that technological developments, rather than taking a linear path are in fact taking place in a cyclical motion, with outside forces continuously at work in moulding these ideas into a prototype which subsequently is formed into an invention or failed prototype. By adding terminology borrowed from actor-network theory as a looking glass I was able to deconstruct car technologies and show that 'the invention' is never a fixed entity as it is under constant influence of social and technological forces. Doing so made it apparent that the car industry has had their fair share of failed or suppressed inventions. While their lobbying kept the radio from being banned in the car in the early 1930s it took a long time for the car industry to react to the upcoming ban on cell phones while driving. Today, governmental organisations like NHTSA are adamant in their strive to make the car a safer place and consequently turn out strict guidelines on in-vehicle infotainment and driverless cars. Car manufacturers find themselves in a quandary, as on one hand they try to keep the car relevant by implementing a vast array of digital systems, and on the other hand try to comply with guidelines and regulations to improve road safety by limiting the use of these systems. I have shown that the car industry can be seen as reactionary, waiting for governmental organisations to suppress the radical potential of their inventions. Strikingly enough, in researching how the car is presented as a smart environment, I myself had to work trough vast archives that have yet to be digitised. While my research method unearthed interesting findings, I hold no doubt that future research in these archives — with the ANWB making efforts into digitisation — will unearth interesting media text that I have missed. It would simultaneously provide for a more rigid research method based on for instance keywords and/or publishers then random sampling.

However, my research method did enable me to explore the myths and rhetorics used by the car industry and make it clear that myths not only form a source of inspiration for the general public but they actively intervene in decision making processes throughout society and carcompanies themselves, who after presenting their cars of the future using popular media rhetoric to the mass public, try to actively make this future a reality by pouring vast resources into research and development. Instead as shown these myths actively put things in motion, crossing industry boundaries. This could be seen in instances such as the example of the EU subsidised mobility projects such as SARTRE, the efforts of IT companies such as Google and Apple or research companies like TNO to tap into the digitised space of the car or the efforts of legislators around the world who are closely monitoring smart car developments in order to adequately tackle issues on regulation safety, liability, driver distractions and et cetera. All these instances are being brought together and mutually influence each other in a network that tries to make the car as a smart environment a reality.

With large corporations such as Apple, Microsoft and Google now entering the automotive field and partnering up with car manufacturers, the digitalisation of the car will most likely be expedited by the efforts of the car industry to make it a smart environment. It has become clear in this thesis that carmakers themselves are — and have been — struggling to gain traction in the digital world. I exemplified this by discussing failed inventions such as the early in-car touchscreen or dismantling utopian future outlooks to show the mythological concepts that lay at its basis. But as said previously these myths have agency. In this case they have sprouted action amongst companies that were previously unrelated to the car industry as I have shown in my future outlook. These 'foreign' corporations are now looking to join forces with car companies in exchange for a piece of the automotive profit-pie.

Opting for both an historical and current day perspective on the car industry and its developments I have been able to dismantle the rhetoric and myths appropriated by the car industry and show that the way in which carmakers advertise this new and better world of tomorrow has in fact changed little over the course of several decades. Ranging from the Futurama exhibitions to the electronic super highway and ultimately the connected car, all rely on a similar topos of bringing freedom to its user and creating a better world tomorrow where technology will be our very own butler there to attend to our every wish. However, I have shown that the single sided technological determinist stance of the automotive industry is not without danger as humans and technology are in fact tightly interwoven. To focus only on the technical side of motoring means that important aspects in their quest to turn the car into a smart environment, such as privacy or ownership of data, are not top of mind in the automotive industry. These topics are well documented in mediastudies and this knowledge should be taken to heart by the industry. They must be aware, as I have shown in this thesis, that technological developments — or inventions for that matter — are not merely formed in a clinical environment but are subjected to technological and social forces. Moreover it is important to recognise that technologies can be used differently then originally intended.

By exploring the relationship between humans and technology with Winstons model in combination with actor-network theory I was able to show that smart technologies act as a mediator in our lifeworlds. The smart car, by extending its reach trough our nomadic connected devices as discussed in the bring your own device trend, is pervading our lifeworlds even when we are not within the confines of its metal shape. This means that carmakers have to think carefully about the result of the new assemblage that I referred to as the driver-car. The 'always-on' combination of human and technological actors that form this assemblage of mutual influence can have severe impacts on our feeling of autonomy as the driver-car will deeply permeate our life-world. I have discussed that because of this extended reach beyond its physical shape the responsibilities of car manufacturers in regard to privacy, ethics and law will become more complicated. Ironically, the industry that gave us the mechanical means to venture into new and unexplored territories is now finding itself on a path of exploration trough the digital forest which the driver-car calls its playground.

It must be clear that this thesis did not intend on trying to find truisms of the use of future technologies. I did however intend to unmask the single sided media rhetoric appropriated by the car industry that appears to be leading most of todays talks about cars, with popular media playing its part and talking about computers on wheels or smartphone wheels as of lately. Being both a media scholar and petrolhead it was clear to me that the car industry is desperately trying to find its way in the aforementioned digital forest to be able to secure its existence in the world of tomorrow. By opting for media archaeological research in combination with Winstons model I was able to I was able to show how myths are presented on the one hand by doing discourse analysis, and how they fuel technological dreams and actual developments on the other by investigating and deconstructing the process of technological development. By investigating the ideological discourses that surround the automotive industry and combining this with knowledge of the media industry I was able to do some predictions towards future trends such as the use of location based information or the bring your own device trend. As Huhtamo concurs, history cannot claim an objective status as it only becomes conscious of its role as mediator by switching between the past and present. By collecting both historical and current sources during my internship my intentions of showing how the notion of the smart car has evolved I believe I got as close to an 'objective status' of the current state of the car industry that is possible today.

It would be interesting to see how the car industry will evolve over time where both urbanisation and digitisation will play a big role. True smart environments in the car are of yet ideological products of myths rather then materialised products. It would be interesting to investigate how the dichotomy between technological determinists or evangelists like Google's Sergey Brin and digital technological pessimists, or purists as they call them in the automotive world, will play out in the debate on driverless cars versus the skill and reward of taming our metal beasts ourselves. Will the car industry start to rely on innovations brought on from outside companies we all know from Silicon Valley and decide to partner up and share their market? Or will they perhaps pursue the idea of the car as a medium and transform themselves into content providers rather focussing on todays technological differences of horsepower or four wheel drive. Most certainly design will continue to play an important role, in both the physical product as well as human computer interfaces. Scenarios like this are already visible in the digital world where availability and convenience is preferred over ownership, think Spotify for instance. This might mean that car manufacturers will see their cars as 'outlets' in which they are able to offer licensed content to their customers. Or a bit closer to home, what is the effect of having partly computer controlled cars on our society. When computers do all the work, what happens with the revenue of traffic offences such as speeding or false parking? Will it force cities or even governments to alter their tax and revenue models? And from a manufacturers perspective, what happens with BMW "freude am fahren" or Volvo's claim on safety when we don't drive ourselves and crashes will be minimised?

These questions are interesting to adress in the upcoming decades as I have shown that the drive towards digitisation in the car industry has traction. This drive towards digitisation and idea of the car as a medium, means it will become ever more important for manufacturers, governmental organisations and drivers alike to jump on the driver seat and critically reflect on their position and the way they position the driver in relationship to the car, steering clear of potholes from the past.

APPENDIX 5

5.1 NEW YORK SUN ARTICLE ON CAR RADIO (1930)

PUTTING RADIO SETS INTO AUTOMOBILES

Latest Models Can Be Installed Within Few Hours

IN WHITE HOUSE CARS

Full Description of the Sets and Methods of Operation.

To the inspired slogan of motor car manufacturers that "all America is awheel" will be added soon the supplementary phrase "while the band plays on." For the honk of the horn bids fair to be replaced by the cacophony of Glutz's jazz quartet or the somnolent harmony of the Moonbeam Trio. Instead of adding a new gadget to the engine or an additional spotlight on the front bumper the car owner of the immediate future is expected to install a radio receiver in the handy dashboard of his automobile.

In previous years there have been sporadic attempts to adapt radio sets to the automobile but the lack of study, sturdy, powerful tubes limited the application. Since the coming of screen-grid tubes this problem has been overcome to a considerable degree and sets having no more than five tubes are now in daily use supplying drivers and riders of passenger automobiles and buses with continuous enjoyable entertainment.

The first automobile radio could be applied to cars only by exchanging the original instrument board for a new one with the instruments realigned to make room for the radio controls. This was obviously an expense far beyond the reach of many car owners. Later models and those now on the market can be adapted to any car within a few hours and without making fundamental changes in the car equipment or furnishings. Even the difficulties formed by the engine ignition have been overcome with a minimum of apparatus and rewiring.

Run From Car Battery.

The auto sets thus far introduced make use of the regular storage battery of the car plus three or four B batteries housed in a box under the floor or in the tool box or trunk. The aerial may take the form of a wire screen hidden in the top of the tonneau or a flexible tape, tinted the same as the upholstery and tacked like braiding in the corners of the body where it is inconspicuous. The loud speaker, ordinarily a compact magnetic unit enclosed in a wooden cabinet to withstand the shocks of travel, is located under the dash or in one corner of the tonneau according to which location gives the best quality of sound. The tuning and volume controls are placed in a handy position where the driver can make the desired and necessary adjustments without removing his attention from the road ahead of him.

In White House Cars.

Automobile radio has already found a devotee in Mrs. Herbert Hoover, whose personal limousine is equipped with a radio receiving set. It is frequently tuned-in while the First Lady of the Land is out for a drive.

Among the "radio as you go" enthusiasts also is Lawrence Richey, one of President Hoover's secre-

Continued on Thirteenth Page.

Putting the Set Into Automobile

Continued from Thirteenth Page.

taries. His private car, too, has a radio set similar to the one in Mrs. Hoover's. The sets are seldom in use while driving about the city; their owners preferring to operate most convenient to the driver has two universal joints which connect directly to the set. To the left on the control panel is a volume control and on the right is the tuning or station dial. A switch which is locked by a key keeps the garage man from running down the batteries.

The tube equipment consists of two 224 screen-grid tubes, one 227 as a detector and two 112-As in an audio circuit consisting of a stage of resistance coupling and a last stage of transformer coupling.

The plate circuit is furnished by B batteries mounted in a metal case which comes with the set equipment and sunk flush with the floor boards underneath the carpet. An armored cable connects this box to the set proper with the battery wires running through this flexible conduit. B batteries are provided using three 45-volt medium size uprights and two of the 22½-volt C type.

The tube filaments are heated from the storage battery of the car, protected by a fuse directly behind the control panel and by using a series-parallel arrangement, the entire drain on the storage battery is kept down to a little over 2 amperes.

For an aerial installation, copper mesh is used which comes already installed in the roof of some cars. In many cases, cars are already built with a wire mesh used to hold the upper upholstery in place, but if this important item is missing a copper mesh screening can be inserted in the roof of the car by dropping the head lining and tacking the mesh to the wood cross bows.

For a ground, the entire chassis is used. The set is constructed so that the metal frame of the car and the set are bonded together when the bolts attaching it to the metal bulkhead are installed.

The speaker leads are protected with Belden braid as well as the wires that lead to the control panel. This is done to prevent any possibility of noise pickup in unwanted parts of the circuit.

One of the problems in automobile radios is the elimination of noise produced by spark plugs and generator and when the engine is running.

These particular sets come equipped with suppressors and eliminators. The suppressors are used, one in series with each spark plug as shown in the accompanying illustration and a single unit on the center point of the distributor. The eliminators are attached to the generator and the primary of the coil. An extra eliminator is provided when an electric windshield wiper or other device run by an electric motor is used, so that any interference caused may be cut out.

Starting at one end of Park avenue and driving up to Ninety-sixth street it was found that on any given station around the metropolitan section the same volume level was maintained. This same quality of reception was also found in another drive around Prospect Park in Brooklyn.

To the man accustomed to the even unvarying quality and tone of

the refined receiver standing in a corner of his living room the automobile radio presents many interesting variations. For one thing, the portable radio is somewhat directional. With the car pointed in one direction—and not always toward home—the signal may be considerably better. Frequently as the fast moving car passes beneath railroad bridges or other metal structures of any size the signal slumps for the instant restoring itself immediately when the vehicle emerges again into clear territory. The effect of trolley wires and sometimes of telephone wires is very marked. These common installations in the suburb ordinarily aid reception by acting as additional antenna capacity to the set. But these variations are of no importance when considering the value of the set and its utility. They are mentioned here merely as an indication of the problems faced and so successfully conquered by the designers of automobile radios.

A series of parts which can be assembled to meet the special requirements of automobile installation has been brought out by the National Company. This receiver employs five tubes, three of the 224 screen-grid type and two 112-As, arranged with filaments and heaters in series—parallel so as to minimize the drain on the storage battery. The circuits comprise two stages of screen-grid radio frequency with power detection, a stage of screen grid resistance coupled amplification and output stage using a 112-A.

The single tuning control operates through a Vernier mechanism which not only results in fine tuning but also serves as a lock to prevent vibration and jars from detuning the receiver. The filament switch is of the key type.

Constructing the receiver is a relatively easy task as all of the parts are mounted in place with much of the difficult wiring completed at the factory.

The radio frequency transformers and the triple gang condenser are carefully matched before leaving the factory so that the only adjustment necessary after the receiver is completed is to set the trimmer condensers—one on each condenser—which are reached through small openings provided in the cover for the purpose.

Clamps are provided for locking the tubes in their sockets if desired, although this expediency is rarely found necessary. The receiver is so designed that it may readily be moved from the car when not in use.

In most cars a convenient location is behind the dash on the right-hand side as shown in both illustrations. In such a place the mounting-brackets are fastened directly to the front bulkhead. In Ford cars this arrangement is not practical due to the presence of the gas tank. The receiver being readily removable, however, when not in use, provision may be made for suspending it on the front of the dashboard, or, in sedans, on the rear of the front seat.

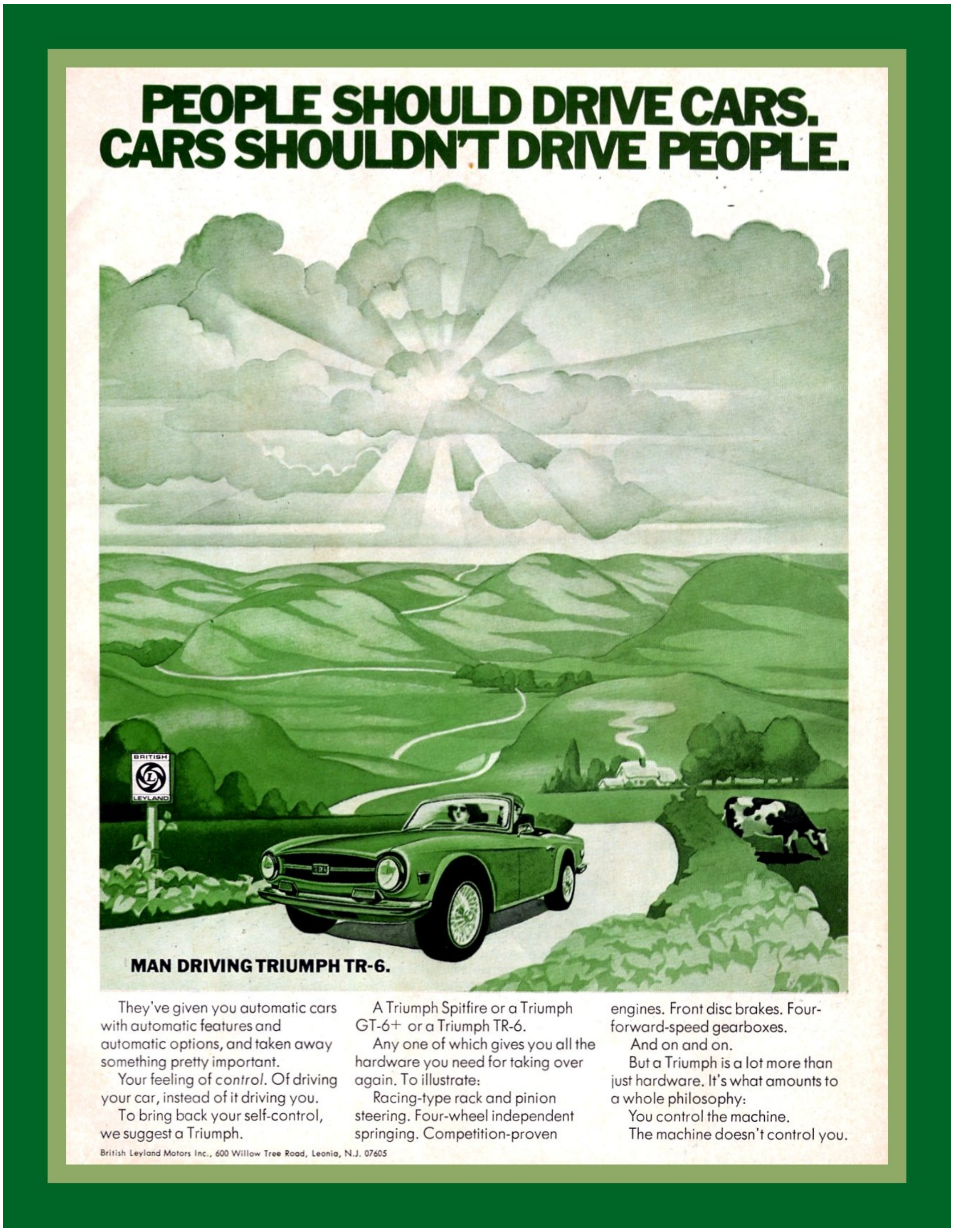
Of course, it is also possible to place the receiver in the luggage compartment or in a metal box under the floor or in any one of a number of other inconspicuous places, and have extension shafts or any other form of remote control brought up to the dash for operation. It is much more practical to locate the receiver in such a place that it may be tuned without recourse to such expediences.

Complete details are supplied for making the connections between the batteries and the outlet box into which the speaker plug is connected. In this outlet box will be found two fuses and a double set of fuse clips. The proper clips in which to place the fuses will depend upon whether the positive or negative side of the car battery is grounded.

The connection between the storage battery and the outlet box is not made directly to the battery itself but to the metal frame of the car and to one side of the dash ammeter. This simplifies the work of installation.

In case of sedans and touring cars the battery box can be placed behind the storage battery by cutting a hole in the floor or where there is a large luggage compartment as in coupes, under the rear deck. In any event, the battery box should be located so as to facilitate occasional testing and replacing of B and C batteries.

5.2 TRIUMPH TR-6 ADVERTISEMENT (1970)



5.3 ANWB ARTICLE ON GPS SYSTEMS (1985)

VERKEER

tekst: Ron Hendriks
illustratie: Rens Biesma

BUITENAARDSE HULP VOOR AUTOMOBILISTEN

In vele laboratoria in de wereld wordt op dit ogenblik gewerkt aan systemen die de automobilist een handje moeten helpen bij het vinden van de weg. In ons eigen land is Philips daar druk mee bezig, maar ook in landen als Duitsland en Japan worden de meest geavanceerde ''elektronische wegwijzers'' uitgebroed. Voorlopig gaat het om nogal kostbare oplossingen, die zeker niet binnen afzienbare tijd een grote opgang zullen maken. Maar er komt een tijd dat u eenvoudigweg de plaats van bestemming intoetst, waarna vernuftige apparaatjes u feilloos duidelijk maken hoe u moet rijden.

De wegenkaart, de wegwijzers en eventueel de verkeersinformatie via de (auto)radio zijn nu de meest gebruikelijke middelen om de juiste route te vinden van de ene plaats naar de andere. Vooral de laatste jaren zijn daar al de nodige elektronische hulpmiddelen bijgekomen, die het leven van de automobilist wat veraangenamen. Zo werd op de autosnelwegen rond Rotterdam en Utrecht een elektronisch signaleringssysteem aangebracht, waarmee men wordt gewaarschuwd voor gladheid, ongevallen, enz. In Duitsland kennen we al langer het zogenaamde ARI-systeem voor de actuele verkeersinformatie. Wie wel eens door de Bondsrepubliek rijdt, zal ongetwijfeld de fluittoontjes kennen waarmee verkeersmeldingen worden aan- en afgekondigd. Die fluittoontjes zorgen ervoor dat dergelijke verkeersmeldingen niet onopgemerkt blijven, tenminste als men over een speciale autoradio beschikt. Deze radio's geven namelijk op gezag van de fluittoontjes ook verkeersmeldingen door als de autoradio niet aan staat, of als er een cassette speelt. Inmiddels is ARI ook in een aantal andere landen in gebruik, zoals Oostenrijk en Zwitserland.

Verder biedt de telefoon nog een aantal mogelijkheden om wat beter voorbereid op pad te gaan. In ons land kennen we behalve de ANWB-verkeersinformatietelefoon ook het medium Viditel. Men kan bellen met de Viditelcomputer (als men over de benodigde apparatuur beschikt). Vervolgens kan men kiezen uit een aantal mogelijkheden. Men kan bijvoorbeeld opgeven van welk punt men wil vertrekken en waar men naar toe moet. Viditel geeft dan aan welke route u kunt nemen en ook nog wat u daarbij onderweg aan verrassingen, zoals tolheffingen, zult tegenkomen. In Engeland gaat men zelfs nog verder. Viditel houdt bij het uitstippelen van de route ook rekening met zaken als wegopbrekingen, type (vracht)auto, tijdstip van de dag, enz. Ook de kosten van verschillende ritten worden becijferd. Dergelijke vindingen bieden natuurlijk al belangrijke voordelen voor automobilisten die regelmatig tussen de wielen zitten, maar er is nog veel meer mogelijk. Want ondanks deze hulpmiddelen, is men nog steeds in belangrijke mate aangewezen op de kaarten, wegwijzers en meestal enige intuïtie om precies op de plaats van bestemming te komen. En het ontwijken van files en dergelijke vereist gewoonlijk nogal wat improvisatie en ervaring.

Verouderd in het experimentele stadium

Dat beseffend, ontwikkelde men in Duitsland bijvoorbeeld het zogenaamde ALI-systeem. Dat komt erop neer dat langs de weg kleine zend/ontvangertjes worden aangebracht, evenals in de

41

VERKEER

auto's. Daardoor wordt het mogelijk om al rijdende informatie uit te wisselen. De automobilist kan op toetsenbord in de auto zijn bestemming intikken. Die informatie wordt onderweg verzonden naar de ontvangers in de berm, die op hun beurt weer informatie over de te volgen route terugzenden naar de auto.
In de praktijk houdt dat in dat een automobilist op een schermpje in de auto de richtingspijlen ziet verschijnen, die hem bijvoorbeeld vertellen welke afslag hij moet nemen.
Het ALI-systeem wordt al enige tijd in de praktijk beproefd op enkele honderden kilometers autosnelweg in Duitsland.
Tot voor enkele jaren, leek dit een veelbelovende ontwikkeling. Maar wellicht is het al achterhaald voordat het definitief uit het experimentele stadium te voorschijn is gekomen. Want een dergelijk systeem vergt gigantische investeringen, omdat het volledige wegennet, te beginnen met de autosnelwegen, moet worden voorzien van vele duizenden zend/ontvanginstallaties plus de bijbehorende detectielussen die als "antennes" in het wegdek moeten worden gefreesd. En voor een land als Duitsland praat men dan over honderden miljoenen guldens. Bovendien beschikt men dan nog "slechts" over een systeem dat qua nauwkeurigheid te wensen overlaat.

Elektronisch kompas

De aandacht is daarom inmiddels verlegd naar systemen die (zoveel mogelijk) onafhankelijk zijn van apparatuur die langs de weg moet worden geïnstalleerd. Daarbij wordt bijvoorbeeld teruggegrepen op het beproefde principe van het kompas, aangevuld met een flinke hoeveelheid elektronica.
Nissan, Toyota, Mercedes en VDO experimenteren daar bijvoorbeeld mee. Het principe komt erop neer dat men start- en eindpunt opgeeft aan de computer die in de auto is ondergebracht. In die computer zit ook een routekaart opgeborgen. Een kilometerteller houdt de verreden afstand bij, en een elektronisch kompas de richting. Door deze gegevens te vergelijken met de ingebouwde kaart, is het mogelijk voortdurend de te volgen route aan te geven, die dan bijvoorbeeld op een schermpje zichtbaar wordt gemaakt.
Ook aan deze oplossing kleven vooralsnog echter bezwaren. De nauwkeurigheid van een elektronisch kompas is door storende invloeden van buitenaf (bruggen, gebouwen) niet optimaal. Om dat te compenseren worden weer aanvullende technieken ontwikkeld. Siemens en Volkswagen werken bijvoorbeeld samen in een project waarbij fouten worden gecorrigeerd met behulp van infraroodzendertjes die op bepaalde punten langs de weg moeten worden geïnstalleerd.
Honda zoekt het een andere kant op. Men maakt gebruik van een zogenaamde gasgyrascoop, gevuld met helium. Bij richtingverandering verplaatsen de heliumdeeltjes zich ten opzichte van de omgeving, en daaruit wordt dan weer afgeleid of men op de gewenste route zit. Helaas moet het gas wel worden gekoeld en dat jaagt de kosten nogal op.
Weer andere fabrikanten denken de oplossing te vinden door sensoren te gebruiken, die nauwkeurig de stuurbewegingen registreren. Met dergelijke systemen zal men vermoedelijk redelijk nauwkeurig zijn weg kunnen vinden. Het einddoel zal weliswaar niet tot op de meter nauwkeurig worden aangegeven, maar men zal er niet meer dan enkele honderden meters naast zitten. Ook niet bij een rit over grotere afstanden.

Per satelliet

Maar zelfs voor de eerste praktijkexperimenten goed en wel op poten kunnen worden gezet, dienen zich al weer nieuwe mogelijkheden aan: buitenaardse hulp ofwel de satellieten. In het bijzonder kan daarbij gedacht worden aan het Amerikaanse NAVSTAR, een netwerk van 18 satellieten dat in 1988 de aardbol zal omspannen. Op elk punt van de aarde zullen dan op elk moment van de dag vier satellieten te ontvangen zijn. Uit de signalen van die satellieten kan men tot op tien meter nauwkeurig zijn plaats bepalen. En in combinatie met andere technieken, zoals in computers opgeslagen landkaarten, kan men zo een verfijnd verkeersgeleidingsysteem opzetten.

Uit signalen van satellieten kan tot op tien meter nauwkeurig de plaats worden bepaald.

Een aantal van deze technieken zijn ook terug te vinden in het project waar bij Philips op dit ogenblik aan wordt gewerkt. Het gaat om het zogenaamde Carin-systeem, wat zoveel wil zeggen als het Car Information System. Hoewel Carin nog in de kinderschoenen staat, hebben de mensen van Philips al hele visioenen van de mogelijkheden die vroeger of later gerealiseerd zouden kunnen worden.
Het systeem is ontwikkeld rond de compact diskspeler. Want behalve voor het weergeven van muziek, is zo'n apparaat ook te gebruiken voor het opslaan van andere informatie. Op een compact disk kan een gigantische hoeveelheid gegevens worden vastgelegd. Om de gedachten te bepalen: bijvoorbeeld 150.000 pagina's tekst. Ruimte genoeg dus om het hele wegennet van Nederland in op te slaan, plus nog een hoeveelheid aanvullende informatie.
Maar zo'n compact disk is op zich niet meer dan een, zij het omvangrijke, elektronische wegenatlas. Het wordt pas een echt verkeersgeleidingsysteem, als het wordt gecombineerd met een plaatsbepalingsysteem. Ook Philips denkt daarvoor aan het principe van het elektronische kompas en het gebruik van navigatiesatellieten.
Om ook zaken als files, gladheid, enz. tijdig te kunnen onderkennen, wil men Carin ook koppelen aan in ontwikkeling zijnde nieuwe radioverkeersinformatiesystemen. Bij dergelijke systemen worden de files niet meer door een nieuwslezer voorgelezen. In plaats daarvan zendt men een serie onhoorbare fluittonen de ether in, die in de auto worden vertaald in begrijpelijke verkeersinformatie. Niet automobilisten zijn daarmee verlost van de voor hen overbodige informatie. En de automobilist krijgt alleen de inlichtingen voorgeschoteld die hij nodig heeft.
Carin kan verder worden aangekleed met allerlei meer of minder noodzakelijke randversierselen. Zoals een elektronische stem die aangeeft wanneer men moet tanken, of die waarschuwt wanneer de temperatuur van het koelwater oploopt. Maar dat is nu al in sommige auto's niet ongewoon meer.

Duizend gulden of meer

Er is dus veel gaande, en als gewoon automobilist lijkt dat op het eerste gezicht allemaal best aardig. Men moet er echter ook geen overspannen verwachtingen van koesteren. Een tiental jaren experimenteren heeft tot nu toe niet geleid tot een echt compleet en betaalbaar verkeersgeleidingsysteem voor de gewone automobilist. Zelfs het meest eenvoudige systeem, het Duitse ARI, is in ons land nog steeds niet ingevoerd. Daarbij kan je je afvragen hoe serieus je al die hersenspinsels van de diverse fabrikanten moet nemen. Ongetwijfeld passen de futuristische perspectieven die ze schilderen aardig in de strategie een vooruitstrevend imago te creëren. En aangenomen dat deze ontwikkelingen inderdaad de kinderschoenen ontgroeien, kun je je natuurlijk wel afvragen of iedereen nu zit te wachten op al dat fraai's. Tenslotte zal er toch dik voor betaald moeten worden. Bedragen van duizend gulden of meer voor een enigszins compleet systeem zullen eerder regel dan uitzondering zijn. Daar komt nog bij dat dergelijke systemen pas kunnen worden ingevoerd, als er sprake is van internationale overeenstemming en dat kan nog vele jaren duren. Bovendien staat eigenlijk nog nauwelijks vast aan welke informatie een automobilist nu echt behoefte heeft en welke hoeveelheid informatie hij kan verwerken.
Voorvechters van deze systemen stellen echter, en niet geheel onterecht, dat er in de huidige situatie veel energie en tijd wordt verspild door het ontbreken van voldoende informatie. In Engeland heeft men bijvoorbeeld becijferd dat een gemiddelde automobilist voor een kleine tweehonderd gulden per jaar nodeloos verrijdt. Bij het beroepsvervoer zou er jaarlijks ruim vijfhonderd guldens worden verspild. Zo bezien zouden er miljarden guldens kunnen worden bespaard, aldus de Engelsen, die daarom onlangs ruim 30 miljoen gulden uittrokken voor een grootscheeps onderzoekproject naar elektronische verkeersgeleiding.
Maar wanneer de systemen definitief uit de laboratoria tevoorschijn zullen komen, zal de toepassing dus waarschijnlijk niet in eerste instantie bij de gewone automobilist moeten worden gezocht. Wellicht wel bij het beroepsvervoer, autoverhuurbedrijven, enz. Want alleen daar zullen de investeringen mogelijk binnen een redelijke termijn kunnen worden terugverdiend.

5.4 FORD LIVINGROOM ON WHEELS (1949)

5.5 DE TELEGRAAF ARTICLE ON THE CAR AS COMPUTER ON WHEELS (1989)

Zo comfortabel is de toekomst in de Renault Mégane. Geen middenstijl, de bestuurdersstoel draait mee met het portier en de stoel daarnaast kan helemaal omdraaien.

Toekomstauto's stelen dit jaar de show

STRAKS RIJDEN WE IN EEN COMPUTER

Vrijwel elk automerk heeft zijn wensen en ideeën verwerkt in een toekomstmodel dat u wèl op de RAI kunt zien staan, maar waarin u nooit zult rijden. Maar in de auto waarin u in het jaar 2000 rijdt, zal veel van het vernuft uit deze *future-cars* verwerkt zijn. Als u er op de RAI even in gaat zitten, zult u merken dat de vernieuwing vooral zit in elektronica. In de toekomst zijn vier apart te besturen wielen doodnormaal, hebben we zonnecellen en rijden we zelfs misschien in een Philips terreinauto! Wij presenteren u enkele van de opmerkelijkste modellen.

door ROB JAGER

AMSTERDAM, woensdag
Kwamen vroeger de meeste toekomstauto's uit Japan, nu zijn het de Europese en vooral de Franse merken, die de toon aangeven. De Renault Mégane is een sterk gestroomlijnde vierdeurs sedan met een uiterst lage luchtweerstand. Inventief is de manier waarop de spiegels en de ruitewisser zijn weggewerkt. De spiegels zijn vervangen door TV-camera's waarvan de beelden op kleine monitoren op het dashboard zichtbaar zijn. De ruitewisser zit in ruststand verborgen achter een klepje.

■ Een mooie vorm, van kunststof en aluminium, met een beeldscherm op het dashboard, kortom: een schitterende aerodynamische computer. Maar zullen we ooit in deze Daihatsu TA-X 80 rijden?

De portieren schuiven te[-]n elkaar en ook hier ont[-]eekt de middenstijl, wat de [-]egang tot het interieur ver[-]makkelijkt. Daartoe draagt [-]ok de bestuurdersstoel bij [-]le bij het openen van het [-]ortier 60 graden naar buiten [-]raait. De passagier voorin [-]an zijn stoel 180 graden [-]raaien voor een beter con[-]ct met de beide achterpas[-]giers. De stoelen achterin [-]unnen naar achteren wor[-]en geschoven of in een ui[-]rst comfortabele slaapstand [-]orden gezet.

Bij de Mégane ligt de na[-]ruk op luxe met o.a. elektri[-]che stoelverstelling, aircon[-]itioning, stuurbekrachtiging [-]n een boord-computer met [-]avigatiesystemen. Het au[-]io-, video- en communicatie[-]ysteem werd in samenwer[-]ing met Philips ontworpen [-]n bestaat uit een autotele[-]oon, hifi-installatie, radio [-]systeem en videorecor[-] ... TV-schermen achter[-]. Er zijn talloze voorzienin[-]en die de veiligheid verho[-]en.

Onder de motorkap huist [-]en 3 liter V6 motor met [-]urbo, goed voor 250 pk. Mid[-]els een vijfversnellingsbak [-]ie naar keuze met de hand of [-]utomatisch kan worden ge[-]chakeld wordt het vermogen [-]vergebracht op de vier wie[-]en. De besturing van de vier [-]wielen wordt elektronisch ge[-]regeld. Bij lage snelheden [-]uren de achterwielen tegen[-]esteld om een betere wend[-]baarheid te verkrijgen, bij [-]oge snelheden sturen de [-]chterwielen mee om de sta[-]iliteit te verbeteren.

Peugeot Oxia

De Peugeot Oxia is een [-]portieve tweezits coupé, die [-]zijn naam dankt aan een re[-]io op de planeet Mars. De [-]arrosserie is vervaardigd van [-]unststof gelijmd op een z.g. [-]oningraat van aluminium. Omdat de motor achterin is gemonteerd, werd het mogelijk een sterk aflopende neus te creëren en een eveneens hellende voorruit. De carrosserielijn loopt vloeiend naar achter door en eindigt in een verstelbare spoiler.

Het interieur is tegelijkertijd luxueus en functioneel. Het dashboard is vervaardigd van geanodiseerd aluminium. Twee modulen geven informatie over het rijdende deel van de wagen en de route. Tot de uitrusting behoort een Michelin Tyre Monitor, die de spanning en de temperatuur van de banden meet. Daarnaast is er een informatiecentrale, bestaande uit een PC met toebehoren. Bij het afzetten van de motor zorgen zonnecellen voor de stroomvoorziening voor de luchtcirculatie, de databank en de navigatieapparatuur.

De Oxia is uitgerust met een V6 motor van 2849 cm³ met 24 kleppen en twee turbo's. Het vermogen is 650 pk, voldoende voor een topsnelheid van meer dan 300 km per uur.

Lancia ECV 2

Uitgesproken sportief is ook de Lancia ECV 2, een experimenteel prototype van een auto voor rally's en races met een opvallende carrosserie, die geheel van verschillende soorten kunststof is vervaardigd. Centraal is een viercilinder motor met 16 kleppen gemonteerd, die voorzien is van een nieuw turbo-systeem met twee turbo's. Bij lage toeren werkt één turbo, bij hoge toeren werken beide. Een speciale interkoeler verkort de turboreactietijd. De motor met een inhoud van 1,75 liter en een vermogen van maar liefst 600 pk drijft de vier wielen aan.

Saab EV-1

Op basis van de 900 Turbo bouwde Saab de EV-1, een 2+2 sportcoupé met een futuristische styling en een duidelijke wigvorm. In deze wagen zijn veel vindingen ontleend aan de vliegtuigindustrie. De bovenkant is geheel van glas vervaardigd, waarbij de achterruit en de kofferdeksel één geheel vormen. In plaats van bumpers zijn er versterkte bumpersecties van kunststof, die over de hele breedte van de wagen doorlopen. In de portieren zijn speciale versterkingsribben gemonteerd die de inzittenden bij botsingen van opzij beschermen.

Een bijzonderheid van deze auto is het ventilatiesysteem. Het glazen dak boven de voorstoelen bevat 66 zonnecellen, die stroom leveren aan een door een elektromotor aangedreven ventilateur. Hoe sterker de straling van de zon, hoe sneller de ventilateur draait. Bij parkeren in de zon zorgt dit systeem voor een aangename temperatuur in de auto. Voorts heeft de wagen speciale smalle koplampen met een grote lichtopbrengst. Voor de aandrijving zorgt een 2 liter turbomotor met een vermogen van 285 pk. De EV-1 heeft een topsnelheid van 270 km/h en accelereert van 0-100 km in 5,9 seconden.

Daihatsu TA-X 80

Daihatsu toont de TA-X 80, een wat de Japanse fabriek noemt „midship coupé", een compacte auto voor zakelijk gebruik en vrije tijd met de nadruk op comfort en rijplezier. De wagen heeft een uitgesproken druppelvorm, waardoor een zeer lage luchtweerstand werd verkregen. De carrosserie met schuifdeuren bestaat uit kunststofdelen en een aluminium buizenframe. Heel bijzonder zijn de stoelen waarvan de schoudersteunen met lucht zijn gevuld. Als de schuifdeur aan de bestuurderskant wordt geopend, draait de stoel automatisch naar de buitenkant waardoor gemakkelijk kan worden in- en uitgestapt. Boven een bepaalde snelheid rijzen grote digitale meters uit het dashboard omhoog waardoor ze beter kunnen worden afgelezen.

Een beeldscherm in het midden geeft alle mogelijke gegevens o.a. omtrent de te volgen route. Er is tevens een telecommunicatiesysteem dat de bestuurder informeert over mogelijke storingen en hem tevens in staat stelt contact op te nemen met zijn huis of met de dealer.

De krachtbron is een V6 motor van 996 cm³ met twee turbo's en vier kleppen per cilinder, die een vermogen van 130 pk levert. Automatische transmissie, elektronisch gestuurde koppeling, aandrijving op elk wiel. Bij doorslaan van een wiel vermindert het systeem zelf de aandrijfkracht op dat wiel. De remmen zijn voorzien van ABS.

Ook het hydropneumatische veersysteem wordt elektronisch gestuurd, waarbij de vering aan de hand van snelheid en rij-omstandigheden wordt afgestemd. Al deze nieuwe technieken zullen in de toekomst in de Charade en andere modellen worden toegepast.

Philips Hunter

Ja, ook Philips staat met een *future-car* op de Auto RAI 89. De Hunter is een terreinauto vormgegeven door International Automotive Design (IAD). Een open vehikel dat volgepropt zit met allerhande geavanceerde communicatiesytemen, waaronder een voor navigatie. Vandaar Philips.

Mazda MX-04

De MX-04 van Mazda is een zogenaamd modulaire auto. In feite een basisgegeven dat is opgebouwd uit verwisselbare onderdelen. Spatborden, deuren, ruiten e.d. zijn in letterlijk een handomdraai te verwijderen. Waardoor een compleet andere auto kan ontstaan. Van een coupé maar zo een cabriolet en andersom. De auto kan naar believen een 4x4 of alleen maar een achterwielaandrijver zijn.

Subaru Jo-Car

De vrolijkste futurecar is de Joyfull Car van Subaru. De Jo-Car, kortweg, is een sportieve tweezitter met een zogenaamde middenmotor. Het uiterlijk mag aan het jaar 2000 en verder denken, de mechanische componenten zijn van nu. Zo zit er achter de multikleps tweecilinder 544 cm³ met turbo, een ECVT (de elektronische variant op de variomatic). Er is 55 pk voorhanden, wat 150 km/u mogelijk maakt.

■ Links: Deze bonkige terreinwagen is van dezelfde fabriek als de breekbare gloeilampen: onze eigen Philips! Hij heet Hunter en zit boordevol geavanceerde communicatiesystemen.

■ Rechts: De vrolijkste futurecar is ongetwijfeld deze Subaru Jo-Car. Een sportieve tweezitter met een middenmotor en een soort elektronische variomatic.

ACCESSOIRES

OPGERUIMD STAAT NETJES

• Voor volwassenen en voor kinderen is de Cartidy een handig attribuut. Wegenkaarten, cassettebandjes en andere losse spulletjes kunnen worden opgebouwd in de nylon tas, die aan de rugleuning van een voorstoel kan worden gehangen, door het handvat achter de hoofdsteun te leggen en de onderkant van de tas aan de stoel vast te strikken met twee koordjes. De Cartidy is 60 cm lang en 40 cm breed en heeft vier opbergvakken met drukknopsluiting. Cartidy kost *f* 39. Inl. Halfords, Veenendaal, 08385-19170.

GARAGE MET ONTBIJT Hotel

HOTELS MET GARAGE

• De meest comfortabele garage vinden wij in het boekje *Garage met ontbijt*, van G. D. de Gier. Hierin zijn meer dan 80 Nederlandse hotels beschreven, die alle onderdak bieden aan auto's van gasten. Daarnaast zijn er gegevens opgenomen over restaurants in de buurt van die hotels en toeristische tips met betrekking tot mooie routes, bezienswaardigheden, monumenten en musea. Uitgegeven door Academische Uitgeverij Amersfoort. De prijs is *f* 19,90 (ISBN 90.6184.3227).

DURE SPEELTJES

• Een duur merk houdt het bij dure accessoires in de vorm van edele metalen en edelstenen. Geel- en witgouden sleutelhangers met robijnen of diamanten, een platina sleutelhanger en colliers en oorstekers met de Flying Lady. Dat hoort bij Rolls-Royce. Zo'n sleutelhanger, van witgoud met 49 Siamese robijntjes, kost *f* 16.500. Zonde om hem in je jaszak te stoppen!

5.6 FINANCIEEL DAGBLAD ARTICLE ON THE CAR AS COMPUTER ON WHEELS (2012)


Autorijden in 2020: computer op vier wielen

Altijd online, ook in de auto. Maar hoe combineer je onbeperkte connectiviteit met veilig verkeer? Automakers zoeken naarstig naar oplossingen.

Henny Hemmes
Amsterdam

In het hart van de nieuwe tijd

De auto gaat digitaal, draadloos en inspanningsvrij. Wat zouden de mogelijkheden kunnen zijn?

Veiligheid

Status bijhouden Maak een gedetailleerd online-verslag van de conditie van uw auto

Automatische alarmdienst Bij detectie van een ongeval sluit de auto automatisch de brandstoftoevoer af en belt 112

Infotainment

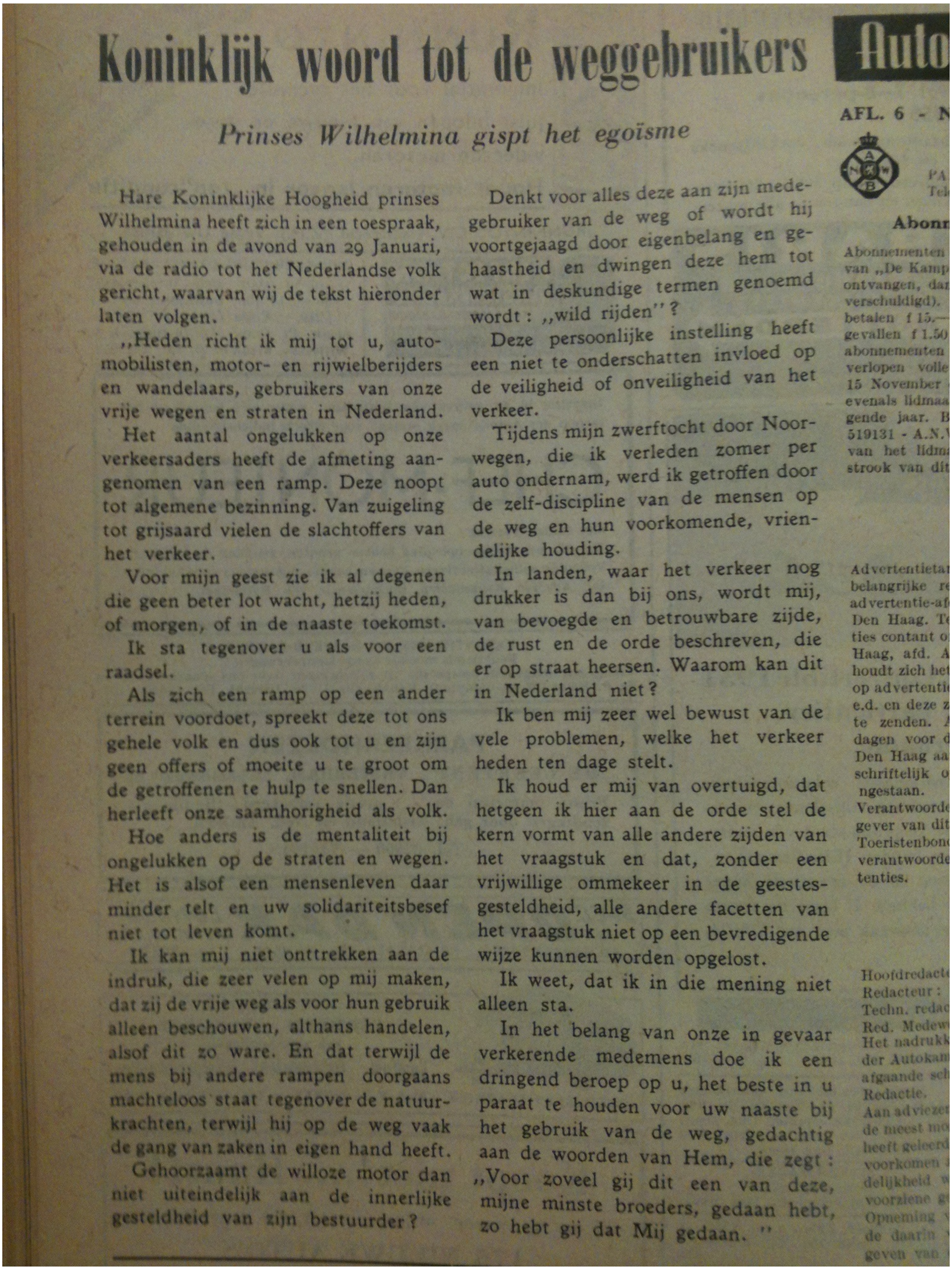
Gemak

Wuifscherm

pagina 22, 19-05-2012 © Het Financieele Dagblad

pagina 23, 19-05-2012 © Het Financieele Dagblad

5.7 speech of princess wilhelmina on the egoism of dutch motorists in autokampioen (1955)



Koninklijk woord tot de weggebruikers

Prinses Wilhelmina gispt het egoïsme

Hare Koninklijke Hoogheid prinses Wilhelmina heeft zich in een toespraak, gehouden in de avond van 29 Januari, via de radio tot het Nederlandse volk gericht, waarvan wij de tekst hieronder laten volgen.

,,Heden richt ik mij tot u, automobilisten, motor- en rijwielberijders en wandelaars, gebruikers van onze vrije wegen en straten in Nederland.

Het aantal ongelukken op onze verkeersaders heeft de afmeting aangenomen van een ramp. Deze noopt tot algemene bezinning. Van zuigeling tot grijsaard vielen de slachtoffers van het verkeer.

Voor mijn geest zie ik al degenen die geen beter lot wacht, hetzij heden, of morgen, of in de naaste toekomst.

Ik sta tegenover u als voor een raadsel.

Als zich een ramp op een ander terrein voordoet, spreekt deze tot ons gehele volk en dus ook tot u en zijn geen offers of moeite u te groot om de getroffenen te hulp te snellen. Dan herleeft onze saamhorigheid als volk.

Hoe anders is de mentaliteit bij ongelukken op de straten en wegen. Het is alsof een mensenleven daar minder telt en uw solidariteitsbesef niet tot leven komt.

Ik kan mij niet onttrekken aan de indruk, die zeer velen op mij maken, dat zij de vrije weg als voor hun gebruik alleen beschouwen, althans handelen, alsof dit zo ware. En dat terwijl de mens bij andere rampen doorgaans machteloos staat tegenover de natuurkrachten, terwijl hij op de weg vaak de gang van zaken in eigen hand heeft.

Gehoorzaamt de willoze motor dan niet uiteindelijk aan de innerlijke gesteldheid van zijn bestuurder?

Denkt voor alles deze aan zijn medegebruiker van de weg of wordt hij voortgejaagd door eigenbelang en gehaastheid en dwingen deze hem tot wat in deskundige termen genoemd wordt: ,,wild rijden"?

Deze persoonlijke instelling heeft een niet te onderschatten invloed op de veiligheid of onveiligheid van het verkeer.

Tijdens mijn zwerftocht door Noorwegen, die ik verleden zomer per auto ondernam, werd ik getroffen door de zelf-discipline van de mensen op de weg en hun voorkomende, vriendelijke houding.

In landen, waar het verkeer nog drukker is dan bij ons, wordt mij, van bevoegde en betrouwbare zijde, de rust en de orde beschreven, die er op straat heersen. Waarom kan dit in Nederland niet?

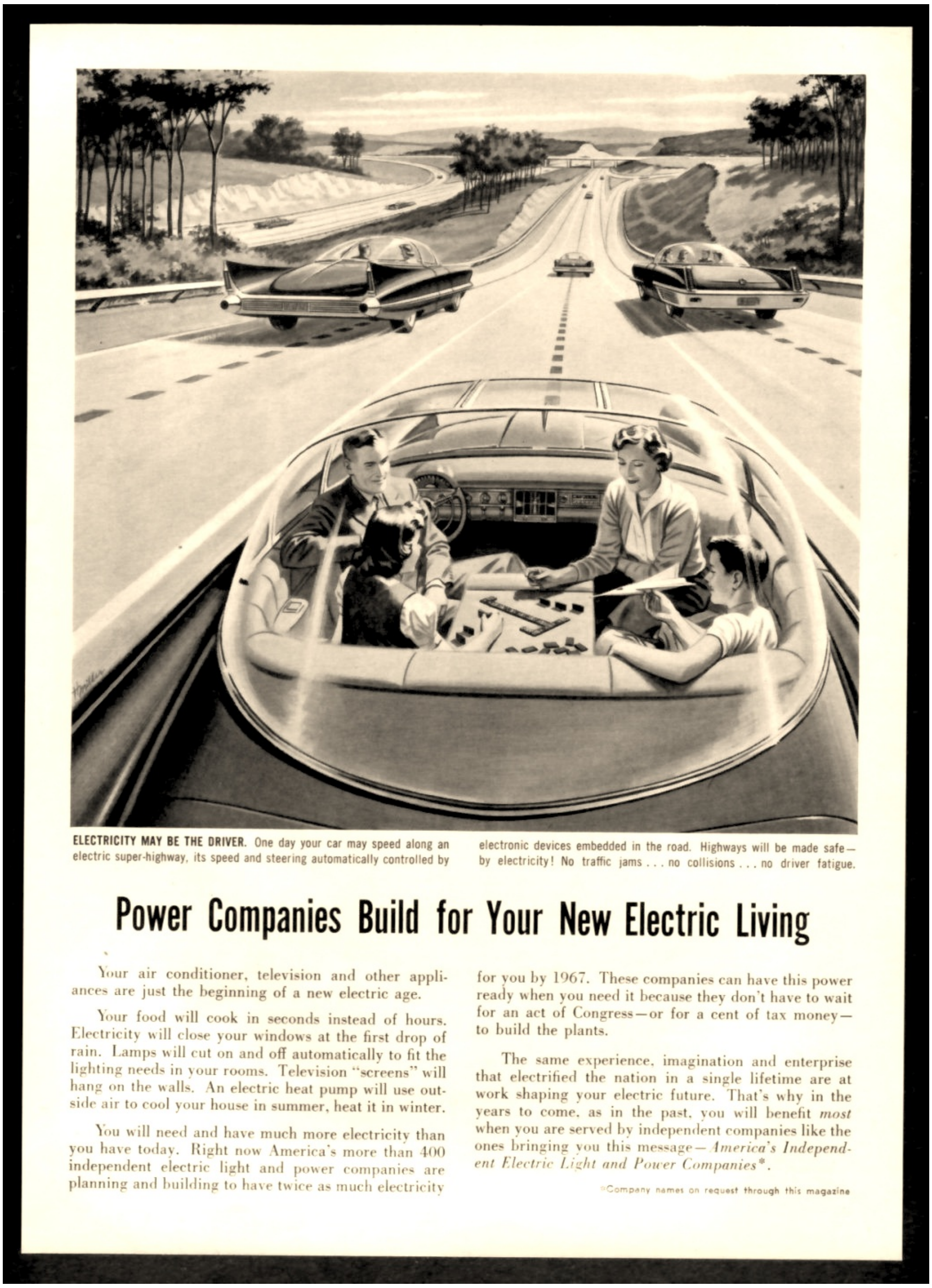
Ik ben mij zeer wel bewust van de vele problemen, welke het verkeer heden ten dage stelt.

Ik houd er mij van overtuigd, dat hetgeen ik hier aan de orde stel de kern vormt van alle andere zijden van het vraagstuk en dat, zonder een vrijwillige ommekeer in de geestesgesteldheid, alle andere facetten van het vraagstuk niet op een bevredigende wijze kunnen worden opgelost.

Ik weet, dat ik in die mening niet alleen sta.

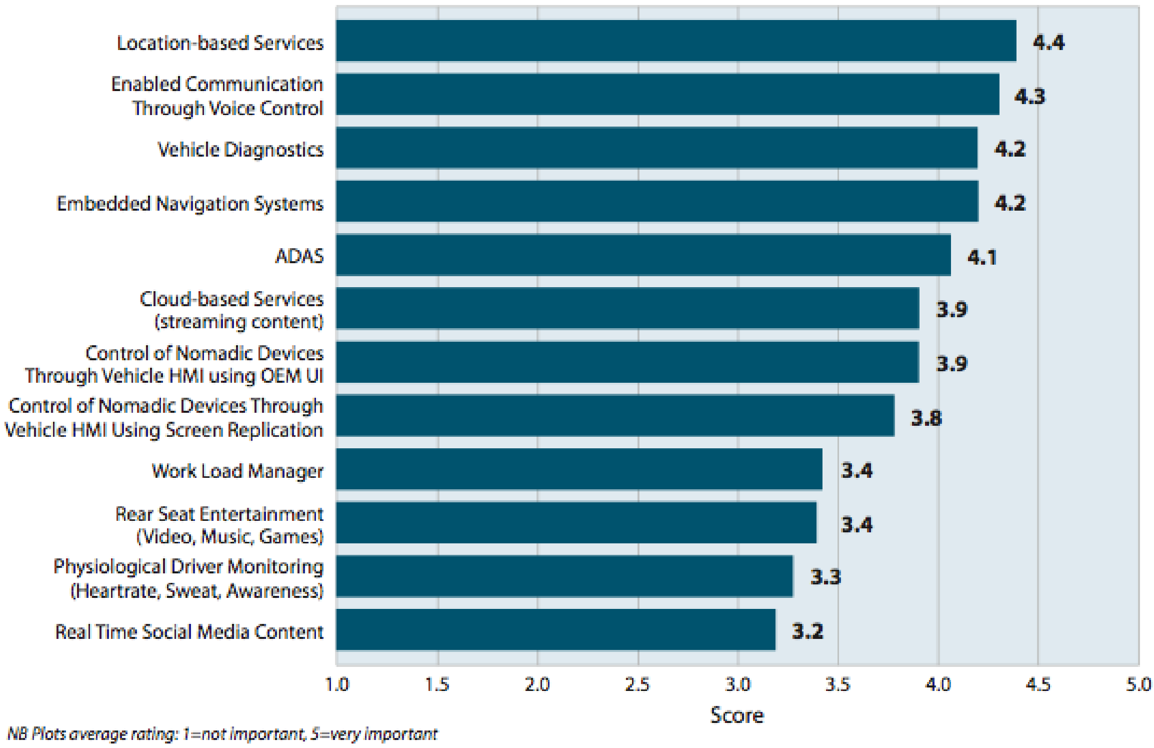
In het belang van onze in gevaar verkerende medemens doe ik een dringend beroep op u, het beste in u paraat te houden voor uw naaste bij het gebruik van de weg, gedachtig aan de woorden van Hem, die zegt: ,,Voor zoveel gij dit een van deze, mijne minste broeders, gedaan hebt, zo hebt gij dat Mij gedaan."

5.8 FAMILY ENJOYING THEMSELVES IN A SELF DRIVING CAR ON THE 'ELECTRIC SUPER-HIGHWAY' (1975)



5.9 TELEMATICS UPDATE GRAPHS SHOWING IMPORTANCE OF TECHNOLOGY FEATURES IN THREE CAR SEGMENTS (2013)

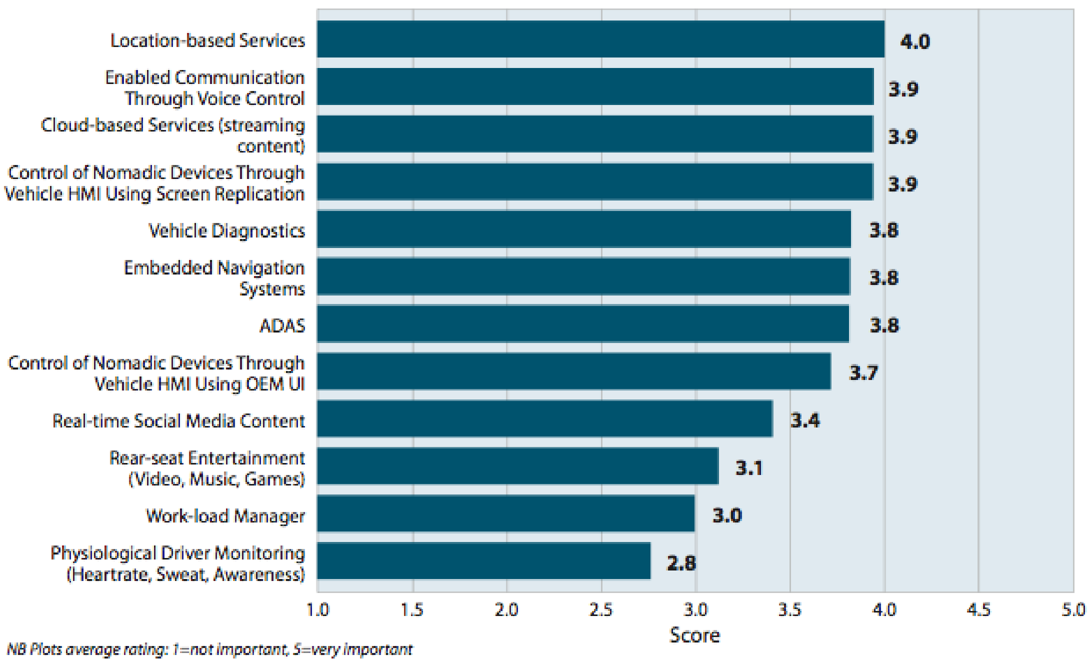
Figure 54: Importance of technology features for premium segment cars



NB Plots average rating: 1=not important, 5=very important

Source: Telematics Update survey, 2012 (respondents = 107)

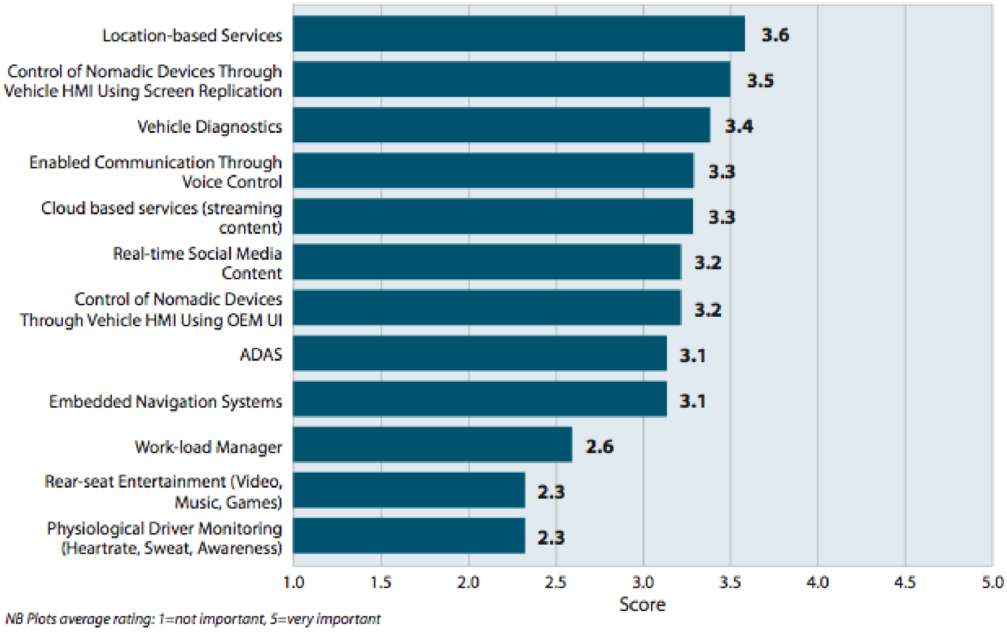
Figure 55: Importance of technology features for mid-size volume segment cars



NB Plots average rating: 1=not important, 5=very important

Source: Telematics Update survey, 2012 (respondents = 99)

Figure 56: Importance of technology features for low-end segment cars



NB Plots average rating: 1=not important, 5=very important

Source: Telematics Update survey, 2012 (respondents = 96)

5.10 PATENTOVERVIEW WORKLOAD SYSTEMS (2012)

Applicant	Name and URL	Description	Date (first registration)
Nissan	Driving assist system for vehicle	A driving assist system for vehicle comprises a state recognition device that detects vehicle conditions of a subject vehicle and a traveling environment for vehicle surroundings; a risk potential calculator that calculates a risk potential for vehicle surroundings based on detection results of the state recognition device; a risk change estimator that estimates change in risk felt by a driver; a correction device that corrects a calculation equation for calculating the risk potential at the risk potential calculator based on estimation results of the risk change estimator; and an operation reaction force controller that controls operation reaction force generated at a vehicle operation equipment based on the risk potential calculated using the calculation equation corrected by the correction device.	08-08-2003
Nissan	DRIVING SUPPORT DEVICE	PROBLEM TO BE SOLVED: To provide a driving support device which can improve user-friendliness and driving support performance. ; SOLUTION: The driving support device 1 estimates right-turn delay time until an own vehicle can turn to the right by a right-turn delay time estimator 20. The driving support device 1 also presents information on right-turn delay time to a driver when it can be determined that the driver intends to turn to the right at an intersection by signals from a right-turn propriety determination section 15, a right-turn intention detector 16, and a self-vehicle status detector 17. Consequently, until the own vehicle turns to the right, the driver can perform other actions such as destination setting of a navigation device, and can pay attention to other actions such as checking of present position for destination setting. Also, the driver can perform right-turn action quickly since the time to start right-turn action can be known easily. Then, improvement in user-friendliness and driving support performance can be achieved.	01-10-2004
Nissan	Driver assistance system and driver assistance method	Risk and/or control status are presented in such a way that the vehicle driver can easily comprehend the fact. Upon detecting risk during driving a vehicle, the vehicle is controlled and information of at least one of the risk and the status of the vehicle being controlled is presented in visual form. In addition, the driver's initiative (D) in driving the vehicle is calculated (step S2), and the visual form, in which the information is presented, is altered depending on the calculated driver's initiative (step S3). When, for example, a lane departure prevention control works, the status of restraining lane departure is presented by arrow(s) in an anti-lane-departure direction opposite to the direction of lane departure. The size (including the length and the width) and color of the arrow(s) are altered depending on the initiative (D). Here, when the initiative (D) is at a low level, the arrow(s) is set in color, for example, 'red' and increased in size because the risk that the tendency of lane departure may increase becomes high.	22-03-2012

GM*	ADAPTIVE DRIVER WORKLOAD ESTIMATOR	A method for adaptive driver workload estimation. A subjective assessment of a driver workload is received from a vehicle driver. A stream of sensor input data is collected from one or more sensors in response to receiving the subjective assessment. A machine learning algorithm is applied to a driver workload estimate model based on the stream of sensor input data and the subjective assessment. The result of the applying is an updated driver workload estimate model.	02-08-2005
GM*	Driver workload assessment system for use by e.g. vehicle navigation device, has microprocessor monitoring driver interaction with device via input buttons, and estimator estimating driver workload based on driver interaction	The system has a microprocessor provided in a driver workload estimator (110) for monitoring driver interaction with a vehicle device through input buttons (105a-105n), for storing driver workload (DW) values for each of the input buttons and for summing the DW values of the individual buttons that are pressed to obtain the estimated DW. The estimator estimates the driver workload based on the driver interaction. Independent claims are also included for the following: (1) a method for real-time assessment of driver workload based on driver interaction with a vehicle device (2) a vehicle device capable of real-time assessment of driver workload based on driver interaction, comprising buttons.	24-06-2005
GM	Driver Configurable Drowsiness Prevention	A driver drowsiness mitigation system of a vehicle includes a driver impairment detection system for detecting drowsiness of a driver of the vehicle. A plurality of alert devices is provided for countering a drowsiness of the driver of the vehicle. A controller enables at least one of the alert devices when a drowsiness of the driver is detected. A prioritized order for enabling respective alert devices is selectively configurable within the controller according to the identity of the driver.	12-05-2011
Ford	Method and device for estimating workload for a driver of a vehicle	Method for estimating workload for a driver of a vehicle comprising the following method steps: identifying a demanding event from a signal indicative of a task requiring driver attention, said demanding event occurring between a demanding event starting point and a demanding event end point in time, and generating a high workload output signal under said demanding event, and workload estimator using such method.	03-09-2003

Ford	Method and apparatus for driver assistence	A method performed by a vehicle computing system includes detecting the triggering of a vehicle sensor indicating an abnormal vehicle condition and determining one or more likely abnormal vehicle conditions associated with the triggering of the sensor. The method also includes accessing a vehicle database to determine one or more pieces of information relating to the one or more abnormal vehicle conditions. The method further includes electronically presenting the one or more pieces of information to a vehicle user.	01-03-2012
Volvo	Method and system for interaction between a vehicle driver and a plurality of applications	A method and system for communication and/or interaction between a vehicle driver (D) and a plurality of integrated and/or non-integrated applications (2; 3) like e.g. native vehicle applications and/or aftermarket applications and/or nomad applications is disclosed. Especially, such a method and system for managing the communication and/or interaction by means of an interaction manager (41) is provided, by which this communication and/or interaction is conducted or managed in such a way that risks and impairments for the safety and comfort of the driver are reduced considerably and workload and distraction of the driver are reduced considerably as well.	20-11-2003
Volvo	SYSTEM AND METHOD FOR MONITORING AND MANAGING DRIVER ATTENTION LOAD	PROBLEM TO BE SOLVED: To provide a system and a method for monitoring physiological behaviors of a driver in which safety is increased by assisting the driver in situations where drowsiness is caused, attention is decreased and/or high-place work is imposed. ; SOLUTION: The system and the method for monitoring the physiological behaviors of the driver includes: a step for measuring physiological variables of the driver; a step for assessing a driver's behavioral parameter on the basis of at least measured physiological variable; and a step for informing the driver of the assessed driver's behavioral parameter. The step for measuring the physiological variables can include steps for: measuring a driver's eye movement; measuring a driver's eye-gaze direction; measuring a driver's eye-closure amount; measuring a driver's blinking movement; measuring a driver's head movement; measuring a driver's head position; measuring a driver's head orientation; measuring driver's movable facial features; and measuring a driver's facial temperature image.	03-02-2011
Panasonic	DRIVING SUPPORT DEVICE AND DRIVING SUPPORT METHOD	PROBLEM TO BE SOLVED: To appropriately provide information for safe driving in accordance with an attention state of a driver. ; SOLUTION: An attention object detection part 3 for detecting an object to which attention should be given on the basis of a signal measured by an input part 2 extracts one or more object which is not immediately dangerous but to which attention should be given. Signals of brain waves measured by a living body signal detection part 4 attached to the driver 1 are analyzed and an amount of attention is estimated by an attention amount estimation part 5. In an information decision part 6, it is decided which information is to be presented to the driver 1 among objects detected by the attention object detection part 3 on the basis of the attention amount obtained by the attention amount estimation part 5. For example, when an attention amount of the driver 1 decreases, presentation of many objects disturbs driving, so that control is	02-03-2010

		performed in order to decrease the number of displayed objects.	
Panasonic	DRIVING ATTENTION AMOUNT DETERMINATION DEVICE, METHOD, AND COMPUTER PROGRAM	Even when a driver is not directing his or her line of sight to objects in the surroundings, the amount of attention of the driver to the peripheral visual region is to be determined, and safe driving assistance is to be provided in accordance with the result of determination. A driving attention amount determination apparatus includes: an electroencephalogram measurement section for measuring an electroencephalogram signal of a driver; a central stimulation presentation section for presenting a visual stimulation in a central visual field of the driver; a peripheral stimulation presentation section for presenting a visual stimulation in a peripheral visual field of the driver; a threshold setting section for setting a determination threshold for attention amount determination from a distribution of amplitude of an event-related potential in the electroencephalogram signal based on a point of presenting the stimulation in the central visual field as a starting point; and an attention amount determination section for determining an attention amount through a comparison between the determination threshold and an amplitude of an event-related potential in the electroencephalogram signal based on a point of presenting the stimulation in the peripheral visual field as a starting point.	15-10-2009
Toyota	PHYSIOLOGICAL CONDITION ESTIMATION DEVICE AND VEHICLE CONTROL DEVICE	Provided are a physiological condition estimation device and a vehicle control device capable of preventing an error in the operation of an apparatus, such as a vehicle, and improving the safety of the operation of the apparatus. The physiological condition estimation device includes an eye-open time acquiring unit that acquires the eye-open time of the driver, a variation calculating unit that acquires a variation in the eye-open time acquired by the eye-open time acquiring unit, and a drowsiness predicting unit that determines the physiological condition of the driver on the basis of the variation in the eye-open time acquired by the variation calculating unit. In this way, since the physiological condition is determined on the basis of the variation in the eye-open time, it is possible to detect a slight reduction in the arousal level and estimate a significant reduction in the arousal level to a value that will cause an error in the driving of the vehicle in the future.	13-02-2009
Toyota*	COMBINING DRIVER AND ENVIRONMENT SENSING FOR VEHICULAR	An apparatus for assisting safe operation of a vehicle includes an environment sensor system detecting hazards within the vehicle environment, a driver monitor providing driver awareness data (such as a gaze track), and an attention-evaluation module identifying hazards as sufficiently or insufficiently sensed by the driver by comparing the hazard data and the gaze track. An alert signal relating to the unperceived hazards can be provided.	14-01-2010

	SAFETY SYSTEMS		
Toyota	SYSTEM, APPARATUS AND ASSOCIATED METHOD FOR INTERACTIVELY MONITORING AND REDUCING DRIVER DROWSINESS	PROBLEM TO BE SOLVED: To provide a system, apparatus and associated methodology capable of accurately and interactively recognizing driver drowsiness so that the drowsiness level of a driver can be made quantifiable, and providing the various arrays of drowsiness reduction exercises to the driver based on the drowsiness level of the driver. ; SOLUTION: The system, apparatus and associated methodology for interactively monitoring and reducing driver drowsiness use a plurality of drowsiness detection exercises to precisely detect driver drowsiness levels, and a plurality of drowsiness reduction exercises to reduce the detected drowsiness level. A plurality of sensors detect driver motion and position in order to measure driver performance of the drowsiness detection exercises and/or the drowsiness reduction exercises. The driver performance is used to compute a drowsiness level, which is then compared to a threshold. The system provides the driver with drowsiness reduction exercises at predetermined intervals when the drowsiness level is above the threshold.	16-09-2010
Toyota	Driving support system	PROBLEM TO BE SOLVED: To provide a driving support system capable of providing driving support without causing discomfort to a driver even when multiple objects that can be targets of the driving support exist in a vehicle driving environment. ; SOLUTION: The driving support system assists driving operations performed by a driver of a vehicle depending on the situations of given objects that exist in a driving environment for the vehicle. When other objects exist adjacent to the given objects as targets of assistance, the driving support system adjusts a support mode (a support level) required according to the conditions of the other and given objects.	04-11-2011
Toyota	Driving assistance information providing device	PROBLEM TO BE SOLVED: To provide a driving assistance information providing device providing information for urging an occupant to use an on-vehicle system at a timing when the occupant easily accepts the information. ; SOLUTION: The driving assistance information providing device 100 providing driving assistance information on an on-vehicle system to a driver includes: means 16, 29 for detecting whether or not the line of sight of the driver is directed to a display 28; a means 14 for providing the driving assistance information to the driver when detecting that the vehicle that the driver rides stops in a state other than a state of waiting for the traffic light to change; and a means 27 for accepting a demand for the usage of the on-vehicle system corresponding to the driving assistance information.	19-05-2011

Toyota	VEHICLE INFORMATION PROCESSING SYSTEM AND DRIVING ASSISTANCE SYSTEM	A vehicle information processing system characterized by comprising: a database which links driving operation information according to a driver and position information for a vehicle to each assistance area candidate, and stores the linked information; and a specifying means which assesses stopping of the vehicle on the basis of the information stored in the database, and specifies an assistance area on the basis of the frequency of stops in the same assistance area candidate. According to this configuration, based on the database storing information for each vehicle the driving behavior of a driver can be learned and the assistance area can be specified for each vehicle, and assistance suitable to a driver can be performed for each vehicle.	19-04-2012
BMW	Driver Assistance System for Driver Assistance for Consumption Controlled Driving	A driver assistance system for driver assistance for consumption controlled driving combines tactile and visual feedback functions, especially in the form of a drive configuration, a display concept and/or a deceleration assistant, wherein the emphasis is, on the one hand, on a modified accelerator pedal characteristic and, on the other hand, on providing ECO tips for an interactive output of efficient driving instructions.	29-03-2012
BMW	Method for the Operation of a Driver Assistance System of a Vehicle	A method for the operation of a driver assistance system of a vehicle (C1, C2), particularly of a motor vehicle and/or a commercial vehicle is provided. A message produced by a central computer (ZR), the message having traffic data (VD) and a confidence parameter (CL) which represents a measure for the reliability of the traffic data (VD) is received by a computer (R1, R2) of the vehicle (C1, C2). According to the magnitude of the confidence parameter, the transmission of a traffic status message (VZD), having at least one time stamp as well as coordinates of the vehicle (C1, C2), is directed to the central computer.	07-10-2010
Audi	Method for operating a driver assistance system of a motor vehicle and motor vehicle	The method involves determining a set of vehicle data characterizing an actual driving situation based on sensors (4). An actual driving dynamic border area of a motor vehicle (1) is determined under consideration of the vehicle data. The border area is utilized as basis for a driving reference output to a driver. The dynamic border area and/or the driving reference are adapted under consideration of an actual condition and/or the driving data characterizing the ability of the driver and/or optimization criterion. An independent claim is also included for a motor vehicle comprising a driver assistance system having a control device for implementing a method for operating the driver assistance system.	06-07-2011
Audi	Method for controlling the operation of a fully automatic driver assistance system of a	The method involves determining the current vehicle guidance state. The driver state value is analyzed by sensors (8,9,10) to automatically detect the derivative value with a respective reference value. A function of the comparison result to prepare driver for a warning.	27-04-2011

	system in motor vehicle e.g. lorry, involves rider-specifically adjusting sensitivity, and activating functionality of system		
Honda	Driver assistence system	The invention relates to a driver assistance controller, comprising: - A plurality of computing modules, arranged in layers (L1...Ln), where each computing module is provided with: a. means for receiving sensorial input data, b. means for receiving top-down information Ti, $i>m$, from higher layer computing modules, c. means for executing an internal dynamic Dm, d. means for reading representations Rj of lower layer computing modules Lj, $j<m$, e. means for creating a representation Rm, f. means for sending top-down information Tm to a module of a lower layer Lj, $j<m$, g. means for outputting sending actuator commands Mm and command priorities Pm, h. means for reporting the current quality of service to a central quality controller, - A central quality controller to handle quality of service information, and - Means of selecting one or more motor commands Mm according to their priorities Pm.	03-11-2010
Motorola	SYSTEM AND METHOD FOR ASSIGNING A LEVEL OF URGENCY TO NAVIGATION CUES	System and method for guiding a driver of a vehicle (20) from a starting point to a destination point using an assignment of levels of urgency of navigation cues. The system comprises a navigation unit (38), a controller (22) and a user interface (42). The navigation unit (38) is capable of selecting a route between the starting point and the destination point. The navigation unit (38) is further capable of generating a plurality of navigation cues to guide the driver along the selected route. The controller (22) is connected to the navigation unit (38) and receives navigation cues. The controller (22) has an urgency calculator (40) that is capable of assigning a level of urgency to the navigation cues.; The controller (22) may also have a workload manager (60) that is capable of classifying an activity state of the driver as well as updating the level of urgency of the navigation cue. The user interface (42) presents the navigation cues based on the level of urgency of the navigation cues.	12-01-2005

Aisin Seiki	SAFE DRIVING SUPPORT DEVICE	PROBLEM TO BE SOLVED: To provide a safe driving support device easily, accurately, and sufficiently supporting safe driving according to the kind of a driver. ; SOLUTION: The safe driving support device 1 classifies patterns of drowsiness for each time of one day by working time zone of a driver over a long period. The safe driving support device 1 determines the drowsiness at an engine start or during traveling for the driver, and executes proper safety support corresponding to the result of determining the drowsiness. Accordingly, the driver acts according to the safety support before or during driving, so that the safe driving support device 1 easily, accurately, and sufficiently supports safe driving.	17-12-2009
Autoliv Dev	A DRIVER ASSISTANCE SYSTEM AND METHOD FOR A MOTOR VEHICLE	A driver assistance system (10) for a motor vehicle comprises an imaging means (11) adapted to record images from a surrounding of the motor vehicle, a processing means (14) adapted to perform image processing of images recorded by said imaging means (11), and driver assistance means (18, 19) controlled depending on the result of said image processing. The processing means (14) is adapted to apply an intensity range reduction algorithm (31) to the image data (30) recorded by said imaging means (11).	08-09-2011
VALEO SCHALTER & SENSOREN GMBH [DE] REILHAC PATRICE [DE]	DRIVER ASSISTANCE SYSTEM FOR A VEHICLE, VEHICLE WITH A DRIVER ASSISTANCE SYSTEM, AND METHOD FOR AIDING A DRIVER WHEN OPERATING A VEHICLE	The invention relates to a driver assistance system for a vehicle (1), wherein the driver assistance system has at least one control tool (2, 4, 6, 9, 11, 14) integrated into the vehicle (1) and/or at least one sensing device (16, 17, 18, 19) integrated into the vehicle (1), wherein the at least one control tool (2, 4, 6, 9, 11, 14) and/or the at least one sensing device (16, 17, 18, 19) has a communication interface (21) via which data can be transmitted directly between the control tool (2, 4, 6, 9, 11, 14) and/or the sensing device (16, 17, 18, 19) and a portable communication tool (22) at least in one direction, said data bypassing an internal vehicle data transmission system (20). The portable communication tool (22) and the control tool (2, 4, 6, 9, 11, 14) and/or the sensing device (16, 17, 18, 19) interact via the data transmission such that at least one function can be performed, said function aiding a driver when operating the vehicle (1). The invention also relates to a vehicle (1) and a method for aiding a driver when operating a vehicle (1).	31-03-2011
CONTINENTAL TEVES AG & CO OHG [DE]	DRIVER ASSISTANCE PROGRAM	A driver assistance system, which outputs information to the driver on the traffic situation in the surroundings and provides assistance, by vehicle components, in order for the driver to handle a current traffic situation.	10-02-2011

5.11 TRANSCRIPTS OF THE CONNECTED IN-VEHICLE INFOTAINMENT SUMMIT IN LONDON (2012)

Disclosure: the following transcripts are excerpts of the full presentation solely intended for academic purposes to be able to partially (re)create the context in which statements were made. The partial transcripts or the complete audio and presentations are explicitly not intended for public release.

5.11.1 *Philippe Colliot — PSA Citroen*

On the question how to answer to the Y generation expectations and how to make the customer work for us with happiness?

In fact when we look at the evolution of the personal computer it seems obvious that they left home and definitely go outside home and office and convergence between automotive world and consumer electronics finally went and arrive in into the IVI systems. And why is there convergence? There are some key events that speeded up this convergence. For instance before speed traps, speed camera's in France personal nomadic devices where not really popular. In fact the reason why people began to buy GPS and personal nomadic devices was because they didn't want to pay too much money because of the speed camera and the only way to limit and know the location of the speed camera was to buy a personal nomadic device and to put it into the car. Of course maybe I could also mention Google Maps. It is also a key event in the convergence of vehicle infotainment and consumer electronics because first Google maps provided free content and so it contributed to make a base and becoming widely popular and of course next step was to provide free navigation on smartphones. And so it is really a revolution because it showed to the customer that he could have free navigation. And after this event it became more difficult to justify the cost of an IVI or navigation system because for the customer it seemed to be free.

There are also some consumption habits and so I could mention the first consumption habit that influenced this trend is that the user used to be connected everywhere and so for the user it seems to be very easy to be connected everywhere quickly. The nomadic devices become more and more user friendly and the users become more and more addicted to the nomadic device. I can say that the nomadic device is now a part of the user and when the user sit into his cars in fact we need to think about the user and his nomadic device. A part of the life of the user is included in the nomadic device. Another consumption habit I would like to mention is Do It Yourself. And Do It Yourself it could also help us for some specific use cases because we could ask/use the customer to enhance the map database with the vehicle system. So we could also use/ask the customer with floating car data and with for instance we could ask the customer to warn of dangerous area and so it could be a way to improve for instance the content of traffic information it could be a way to update the map database and that is what is already done by the map suppliers to reduce the cost of the map release. I could mention of course Open Street Map.

And so, for me, it is like the base of the IKEA business model. Because IKEA makes the customer work for them with happiness but in fact it reduced the service to the customer but the customer seems to be happy. It's a trend. Another trend is the 'want it for free' because people are used to get navigation for free and they are used to get hundreds of thousands of apps for free so the question is how to keep on selling the navigation system.

5.11.2 *Per Lindberg — Volvo*

On the view of the car as a medium that means manufacturers could start creating revenue by connecting the car.

I don't think there is a simple answer how we can create revenue. What I think I can do is share some insights in where we are today at Volvo and how we see this rolling out in the future. I've also been asked to take a look at the different connectivity options during my talk here today. Before joining Volvo I used to work at a mobile network operator for five years doing business development for automotive connectivity.

To start with, let's take a look at what we have today. Which is our classic telematics system I would say called Volvo OnCall. It's been on the market since 2001 so for a pretty long time now. We stuck our toes in telematics as most OEMS did in the early 2000s but we stuck with it and continued to develop the service and expand it to new markets. From the beginning Volvo OnCall was a very traditional telematics service focussing on safety and convenience functions. How did we do with Volvo OnCall? Not very well. I'm surprise it hasn't been killed-off several times. It has never been a great success until two years ago, when we finally found something that made Volvo OnCall work as a service. And that was when we started adding more convenience functions and when we started building apps around Volvo OnCall. We used Volvo OnCall as a communication base platform in the vehicle but started building customer functions that the customers could relate to every day. Not the security service that they hope they would never need. And today Volvo OnCall is sold in 40 markets and right now we have a fantastic development of sales of OnCall. So it's booming I would say, which is fantastic.

If like me you have been in the industry since 1995 it's really interesting to see things finally taking off. So what happened when we started adding more customer oriented features? We gave the customer something to relate to and we gave the dealer something to talk about. Something they could show to the customer. Because I think that's something that we often forget when we talk about all of these fantastic features and functions; we need to sell them. Someone needs to sell these services, they don't sell themselves.

So how will revenue streams when we start connected the car change? To understand this we first have to look at the revenue streams of cars that are not connected, how do we make money as a car OEM. First of all we make money on selling cars. That's one of our primary sources of income. We make money on selling service for those cars, and on spare parts. So now we have our car, we have our Volvo V60. Let's connect that. What happens? What will we make money on then? Will we start earning a fortune on selling apps for that car? Will we be able to sell a lot of map upgrades? Will we be able to sell new navigation features? Yeah we will. But will it be the main revenue contributors? No, I think the main revenue contributors for cars that are connected will still be the way we sell cars and service and spare parts. We may get some additional revenue from selling these connected services but what connectivity gives us is the possibility to really enhance and strengthen these core offerings. So it's not a revolution. We won't become Apple overnight earning a fortune on selling services. But we will get a good way of strengthening our existing core business. And our core business is cars. But we don't earn money by connecting cars. What we should connect is the customer. It's the customer that should be the focus on what we do. It's the customer that has the money that brings us the revenue. So it's about connecting the customer not the car. Ok that's what we need to do; we need to connect the car.

5.11.3 *Tom Wellings - Jaguar Landrover*

On the quality of infotainment systems compared to tablets. At the time of this presentation Tom Wellings was no longer an Jaguar Landrover employee.

Ok. So [according to Cadillac's Clue commercial] the simplicity of your tablet has come to your car. Now, I don't think that's a universally accepted truism yet. And I think that's something that really should be something we're discussing in this forum here. The way we interact with tablets, is that suitable for interacting with safety-critical devices in your car. Is it something we actually aspire to? I think of all serious issues that are brought up by that. But we can clearly see that this is the way manufacturers are heading. It looks shiny and it looks new and it looks like we are heading to the future, but it's not clear whether it is going to be universally embraced yet. Here is another manufacturer that is going down that route. This is the Tesla's 17-inch touchscreen. No hard keys at all. Again same sort of arguments. So, what we've seen is a move from mechanical switches to membrane switches and now [. . .] proximity sensing switches. These sort of changes is really having an impact on the visual demands we are placing upon drivers now within our cars. The haptic component of using these touchscreens is either non-existent or its quite small. I mean I know there are haptic feedback devices in touchscreens but they are not the same as using or getting the feedback from a switch. And although research has shown they do show some benefits you are not replacing like with like. So I am contending that this is a styling and marketing driven move. And I am interested in hearing what you say about that.

Just a few comments of customers and users of these sort of interfaces and what they think of the idea of interacting with a tablet rather than some switches. The one that I particularly like here, and I'm not having a go at Cadillac for this, because they are by no means the only manufacturer who are going down this route. "I love what you've become Cadillac. I only want good things for you. But if you can't give me actual buttons with tactile feedback that I can use whilst watching the road I'm afraid it's over between us". That's quite a strong emotion there and worth remembering.

5.11.4 *Ian Kendall - Bentley*

On the different types of information coming into infotainment systems and lack of standardisation

Sadly the audio of Ian Kendall's presentation is unavailable.

5.11.5 *Henry Bzeih – Kia Motors*

On millennials and subsequent choice for embedded or bring your own device telematics

So before we get to far into this we should probably talk about why are we here today. Why are we so interested in this connected vehicle. It's quite simple really if you look at this survey that was done trough a US newspaper, Detroit News. And essentially what this survey was about they asked people that know about millennials, millennials are 18 to 24 year olds, given the option between a new iPhone or a new car that person that knows that millennial what their thought would be what this millennial would choose. So according to the survey 1/3 would want a new car. 2/3 would want a new iPhone. So again, it's a survey, it may mean something it may mean a lot but it tells you a little bit of the thought process of why connected vehicles are important. And if OEMS out there are thinking about connected vehicles my recommendation is that they should.

So in terms of the sheer amount of money and buying power of these millennials is quite large, about a trillion dollars. Unfortunately for us as OEMs their interest is more in technology side, and less interest in the car side. Which is different from what we grew up with. So even if they are looking at cars you find that they are looking at things in terms of technology. So electric vehicles are top of the list, hybrid vehicles comes in next. And the gasoline engine is the last of the list. From vehicle technologies they are looking at in dash technologies as a must for their car. They want touchscreen interfaces, they want smartphone applications and they are willing to buy additional accessories and upgrades on a regular basis. So this is the world we life in today and as visionaries and leaders from our own companies we have to draw a five year plan in terms of providing those customers with what we think they need at the time.

So today the topic is embedded or nomadic, or bring your own device. They are really the two solutions out there in the telematics world. Obviously we are all familiar with the embedded device solution. Many OEMS out there are using this, which utilises an embedded modem in the instrument panel and relies on a tier 1 telematics service provider for services. And usually there is an agreement with the a wireless carrier as was suggested earlier. And rely on call enters for triage of customer interface. So the strategy is normally subscription based. Somehow we have to recoup the costs and gives away the vehicle hardware in hope of recouping this investment when the customer subscribes. So like I said many OEMs are using this today and there is definitely some stability in terms of market share. From a KIA perspective we don't use this strategy so we want to be upfront we definitely centre all our strategies on BYOD. Bring your own device. So in terms of what does that do, it uses connectivity by using the customers' device trough Bluetooth SPP in most cases, and USB. And some OEMS have used DOV, data over voice, and embedded modem solutions as well. So the smartphone will provide the data transport layer and access to the cloud services and other services and this is really leveraging the customer's existing data plan. Only to provide these services, mostly subscriptions. And we recognise that many OEMS are adopting this strategy in an increasing rate, especially in the US.

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