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A. CBS NUMBERS

Kerncijfers (slot)

	Eenheid	2000	2010	2013	2014	2015	Bron
Verkeersveiligheid							
Verkeersdoden	**Aantal**	1166	640	570	570	621	CBS
Ernstig gewonden	**Aantal * 1000**	15	19	19	21	.	SWOV
Energieverbruik							
Verbruik brandstof wegverkeer	**PJ**	434	473	447	418	419	CBS
Verbruik brandstof railverkeer	**PJ**	7	8	7	7	7	CBS
Verbruik brandstof scheepvaart	**PJ**	565	590	542	497	528	CBS
Verbruik brandstof luchtvaart	**PJ**	142	145	148	153	161	CBS
Milieu							
Uitstoot CO_2 wegverkeer	**Mld kg**	28	30	29	29		CBS
Uitstoot NO_x wegverkeer	**Mln kg**	155	108	90	82		CBS
Uitstoot PM_{10} wegverkeer	**Mln kg**	11	7	5	5		CBS
Uitstoot NMVOS wegverkeer	**Mln kg**	66	32	28	27		CBS
Transportbranche							
Werkgelegenheid	**Werkzame personen * 1000**	.	497	490	488		CBS
Netto-omzet	**Mld euro**	.	67	75	78		CBS
Overheidsinkomsten gerelateerd aan vervoer							
Motorrijtuigenbelasting	**Mld euro**	2,8	5,1	5,0	5,4	5,5	CBS
Accijns op benzine	**Mld euro**	3,2	4,1	4,0	4,0	4,1	CBS
Accijns op overige minerale oliën	**Mld euro**	2,1	3,6	3,6	3,8	3,8	CBS
BPM	**Mld euro**	2,9	2,1	1,2	1,1	1,4	CBS

Kerncijfers

	Eenheid	2000	2010	2013	2014	2015	Bron
Personenmobiliteit (in Nederland)							
Totaal	**Km pppd**	.	30,3	30,5	30,7	.	CBS
autobestuurder	**Km pppd**	.	15,3	15,6	15,6	.	CBS
autopassagier	**Km pppd**	.	7,3	6,8	6,7	.	CBS
openbaar vervoer	**Km pppd**	.	3,4	3,9	3,6	.	CBS
langzaam verkeer	**Km pppd**	.	2,6	2,7	3,0	.	CBS
lopen	**Km pppd**	.	0,9	0,8	0,9	.	CBS
overig	**Km pppd**	.	0,8	0,8	1,0	.	CBS
Luchtvaart	**Aantal passagiers**	40,8	48,6	58,0	60,9	64,6	CBS
Goederenvervoer (van, naar en in Nederland)							
Totaal	**Mln ton**	1502	1717	1717	1746	.	CBS
wegvervoer	**Mln ton**	669	705	691	696	.	CBS
zeevaart	**Mln ton**	424	568	558	570	.	CBS
binnenvaart	**Mln ton**	275	302	307	318	.	CBS
pijpleidingvervoer grensoverschrijdend	**Mln ton**	104	106	123	122	.	CBS
spoorvervoer	**Mln ton**	28	33	37	38	.	CBS
luchtvaart	**Mln ton**	1	2	2	2	2	CBS
Verkeersprestatie (van Nederlandse voertuigen)							
Personenauto's	**Km/jaar *1000**	.	13,2	13,0	13,0	.	CBS
Vrachtwagens	**Km/jaar *1000**	.	36,9	36,3	36,2	.	CBS
Trekkers voor oplegger	**Km/jaar *1000**	.	81,1	76,6	77,7	.	CBS
Bestelauto's	**Km/jaar *1000**	.	17,9	17,7	18,0	.	CBS
Vervoermiddelen (met NL kenteken)							
Personenauto's	**Aantal * mln**	6,3	7,6	7,9	7,9	8,0	CBS
Bestelauto's	**Aantal * 1000**	696	872	832	815	815	CBS
Vrachtwagens	**Aantal * 1000**	83	73	67	65	63	CBS
Trekkers voor oplegger	**Aantal * 1000**	57	72	70	71	71	CBS
Bromfietsen en scooters	**Aantal * 1000**	.	.	1081	1097	1120	CBS
Motorfietsen	**Aantal * 1000**	414	623	653	654	652	CBS
Bussen	**Aantal * 1000**	11	12	10	10	10	CBS
Infrastructuur							
Lengte van wegen	**1000 km**	.	137	138	139	139	CBS
Lengte van spoorwegen	**Km**	.	3013	3013	3032	3031	CBS
Lengte van vaarwegen	**Km**	.	6220	6242	6251	6261	CBS
Nabijheid van voorzieningen							
Nabijheid oprit hoofdverkeersweg	**Km**	.	1,7	1,7	1,7	1,8	CBS
Nabijheid treinstation	**Km**	.	5,1	5,0	5,0	5,0	CBS
Nabijheid school voor voortgezet onderwijs	**Km**	.	2,4	2,4	2,4	.	CBS
Nabijheid ziekenhuis	**Km**	.	4,8	4,7	4,7	.	CBS
Nabijheid huisarts	**Km**	.	0,9	0,9	1,0	1,0	CBS

B. MOBILITY MODES

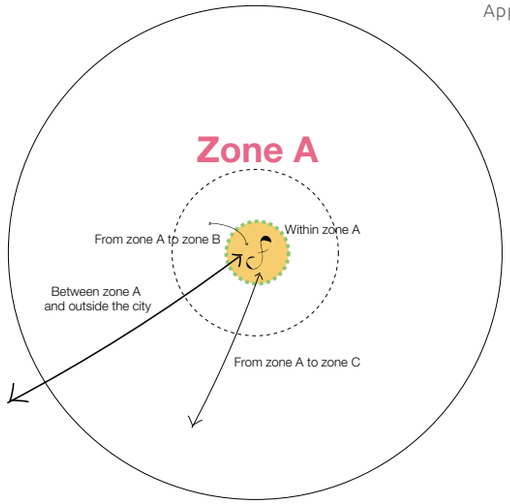
Public transport

Delivery modes

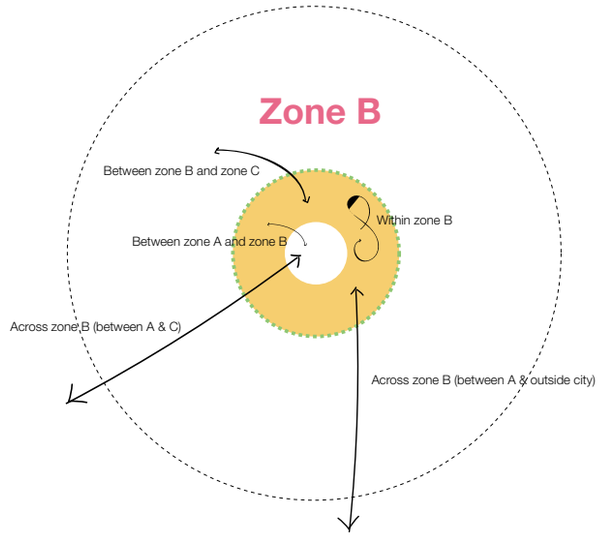
Open mobility

	AIRPLANE	BOAT	TRAIN	METRO	TRAM	BUS	TRUCK	CAR	SCOOTER	BICYCLE	FOOT
Users People Goods & Services Maintenance	P, G&S	P, G&S, M	P, G&S	P	P	P	G&S, M	P, G&S, M	P, G&S	P, G&S	P, G&S
General	An airplane is commenly used for transportation across very large distances for people and cargo.	The boat can be used in two different ways, for the transportation of people over small or large distances, and for the transportation of goods across very large distances.	The train is commenly used for transportation of goods and/or a large amount of people over larger areas in the country (or across multiple countries).	The metro is used within cities for the underground transportation of a large amount of people.	The tram is used for the transportation of a large amount of people within a city and sometimes across multiple cities.	The tram is used for transportation of a large amount of people within a city and sometimes across multiple cities.	The truck is able to transport larger amounts of goods and services on road across large destinations across a continent.	The car comes in different forms and is able to transport goods, services and people in often small amounts over small and large distances.	The scooter is one of the smaller modes of transportation, moving one or two people (or goods in other cultures) over small distances.	The bicycle is a small mode of transportation that (often) requires energy from people to move. Used for small distances.	This mode of transport is used to cover very small distances. If carrying goods, the person is the mode of transport.
Challenges	The airplane is becoming more and more cheap, therefore making it more accessible for everyone. It is still a very unsustainable and mode of transport which causes a lot of pollution and is not usefull to travel short distances.	The boat is not commenly used for people transportation as it is only useful for transportation over water.	The train is a very popular mode of transport in the Netherlands because distances are relatively short between cities. Therefore, trains and rails are often overcrowded and unreliable.	The metro is very efficient for transportation within a city as it travels underground. Unfortunatly, not all cities have such a underground system is place and investment costs are very high.	The tram often has more flexible stops than the metro as it travels above ground. It is also able to transport more people that a bus. Challenges are the large investment costs for such a network and that the rails cannot be moved easily.	The bus is a very flexible mode of transport for a large amount of people in urban areas. Challenges are that this mode of transportation is often a victim of traffic jams.	The truck comes in different sizes and is made for transporting goods and services on the road. Challenges are that they are not space efficient, and not flexible in urban area's. This causes traffic jams.	The car is one of the most flexible mobility modes. However, with ever growing cities, cars take in to much space and are not efficient in the way they are used.	The scooter is efficient in use of space and does not need human energy to move. Challenges are that they can only carry one or two persons and is not very wanted in bad weather conditions.	The bicycle is a very promising mode of transportation as it is very space efficient. Challenges are that they are only useful for relatively small distances and are not very wanted in bad weather conditions.	Movement by foot is one of the most popular modes of transport is very high density populated area's. Challenges are that it costs human energy and is the slowest mode of transportation.
Overall			Public transport in general also has several challenges and benefits worth mentioning. • Benefits: (1) it is efficient, able to transport very large amount of people, (2) pay per use model instead of high investment costs that come with buying a car. • Challenges: (1) no last mile coverage, (2) not the independent, flexibe and freedom feeling people have with owning a car, (3) outside peakhours, often empty.				It has become very blurry what a car actually is (small truck can be seen as a car) and how it is used (different business models), especially with autonomous and electric technology.		Open transporation in general has several challenges and benefits: • Benefits: (1) it causes much less space than closed transportation, (2) it is a healther mode of transport for people and environment. • Challenges: (1) Its popularity is linked to weather conditions, (2) it is only useful for relative small distances.		
Urban areas A	X	X	V	V	V	V	X	X	V	V	V
B	X	X	V	V	V	V	X	V	V	V	V
C	X	X	X	V	V	V	V	V	V	V	V
	Only for large distances across cities, counties or continents	For this assignment, this mode of transport is not used.	Useful mode of transportation for getting in and out of the high density city areas.	Useful mode of transportation in urban areas, although not available in Eindhoven.	Useful mode of transportation in urban areas, although not available in Eindhoven.	Useful mode of transportation in urban areas.	Preferably, the truck is left out in urban areas. However, goods, services and maintenance still need to be accessible.	The current car will graduately be moved out of the city. With rising technologies, other modes of transportation that transform from the car can be developed.	Useful mode of transportation in urban areas.	Useful mode of transportation in urban areas.	Useful mode of transportation in urban areas.

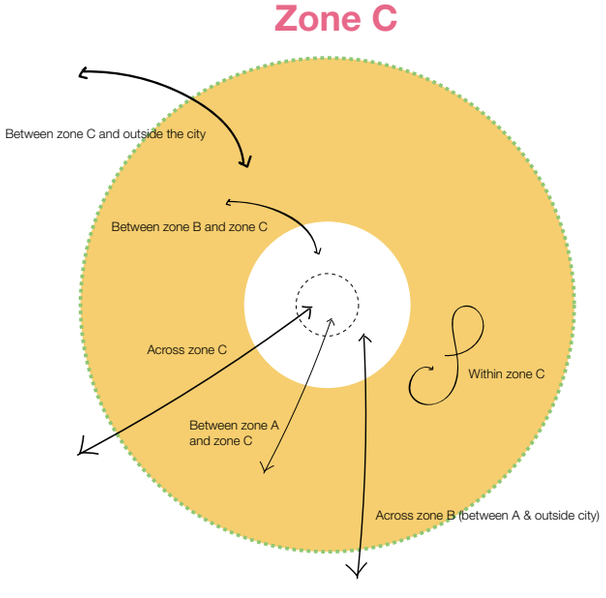
C. MOBILITY OPTIONS



- Within zone A
- Between zone A and zone B
- Between zone A and zone C
- Between zone A and outside the city
- Ring A



- Within zone B
- Between zone A and zone B
- Between zone B and zone C
- Across zone B (between A & C)
- Across zone B (between A & outside city)
- Ring B



- Within zone C
- Between zone B and zone C
- Between zone A and zone C
- Between zone C and outside the city
- Across zone C (between A & outside city)
- Across zone C (between B & outside city)
- Ring C

D. AUTONOMOUS TECHNOLOGY

The design approach clearly states that value creation changes over time. If Ford wants to create value from autonomous technology, they need to investigate if it can improve the quality of life and value is shared equally. I did research on the historical development of autonomous technology, as for its current advantages and challenges towards implementation within the ecosystem.

Developments towards autonomous technology so far

While the technology of AVs gained popularity in research and media over the last years, research for autonomous possibilities started already in the early 1900's (Lipson & Kurman, 2016). Research was done primarily on how to build smart roads, because cars were not able to embody the technology at that point. As the knowledge economy (see Part A5: Design Approach, explained by Brand & Rocchi, 2011) arose with the internet, technological developments rise exponentially. Original Equipment Manufacturers (OEM's), software companies such as Google, and popular platforms (e.g., Uber) are enabling AVs. They need to recreate parts of the current mobility system, therefore involve stakeholders who are involved, and collaborate with other businesses (Fraedrich, Beiker, & Lenz, 2015; Spickermann et al., 2014). With the technology of autonomous driving almost ready for implementation, stakeholders are getting concerned how this should be applied in the market.

Advantages of the autonomous vehicle

As a result of the gained popularity for autonomous technology, a lot of research has been done on the effects of AVs. This chapter explains some of the benefits on safety, environment, traffic and parking.

SAFETY

Human driven cars kill around 1.34 million people around the world every year (World Health Organization, 2014), where 90 percent is caused by human errors (Fagnant & Kockelman, 2015). A study from the United States (US) estimates that if 90 percent of the cars were autonomous, driving related incidents would decrease around 66 percent (Fagnant & Kockelman, 2013) as the safety risk of human driven cars lies in the elements of distraction, drivers fatigue, risky behaviour, etcetera (Fraedrich et al., 2015).

SUSTAINABILITY

Prior research on using autonomous fleets shows us that cities using shared AV fleets, the number of vehicles could be reduced with 90 percent (Martinez, 2015). McKinsey reports that AVs will be able to brake and accelerate more gradually, saving fuel up to 20 percent (Manyika et al., 2013). As the current business model stimulates the degradation of vehicles ('sell as many products' (Brand & Rocchi, 2011)), AV fleets will push more sustainable business models ('pay per use' or 'subscription based'), therefore junkyards with decommissioned car bodies will decrease.

DELAYS

Current development such as population growth and urbanization are overflowing our current transportation systems which were originally designed to accommodate a fraction of their current load (Harris & Tapsas, 2006; Huitema, 2014; Schrank, Eisele, & Lomax, 2012). Traffic jams cost the US economy $78 billion dollars in 2005, which resulted in 4.2 billion hours lost (Peirce, Johnson, Peters, & Rodin, 2008). Travelers face challenges in cities of heavy traffic, planning complexity, and unsafe biking/walking conditions (Department of Transportation, 2017). Estimations are that in 2050, urban travellers will spend around 106 hours in traffic jams per year, triple the time it is today (Lerner & Audenhove, 2012). Adding to benefit of less vehicles with shared fleets, eliminating human caused backups in AVs will safe space and time between vehicles (Fraedrich et al., 2015).

LESS PARKING NEEDED

Vehicles on average are parked 95 percent of the time, this is inefficient (Alessandrini, Campagna, Site, Filippi, & Persia, 2015; Barter, 2013). A vehicle often needs multiple parking spots (e.g. home, work) which mostly are not used at the same time. Parking in close habited urban areas causes major problems. If all parking spaces of a city would be laid out, it would cover a significant amount of the space in city centers (e.g. Los Angeles 81 percent, Texas 57 percent, London 18 percent; Kenworthy & Laube, 1999), therefore AV could also be seen as an opportunity to liberate cities from parking spaces. In order to gain as much value for urban areas, a holistic view on the urban landscape needs to be mapped (Lipson & Kurman, 2016) to have an overview of urban mobility and stakeholders' value. This is necessary in order to keep the eco-system optimal. A solution for one stakeholder (e.g. extra train station) can have dramatic consequences for the other (e.g. longer train times, so the car becomes more preferred, which enhance congestions). Possible pitfalls could be a loss of mingling or window shopping which could lead to abandoned urban areas. Reason for this is that people are delivered a 100 percent from A to B, there is no 'last mile' anymore where normally, mingling occurs.

Challenges of Autonomous Vehicles

While sufficient arguments are stated in favour of autonomous vehicles, there are also some downsides that need to be addressed. To overcome possible technology rejections and barriers, these arguments needs to be taken into account (Fagnant & Kockelman, 2013).

PRIVACY OF DATA

To increase the likelihood of autonomous technology being accepted by the population, AV manufactures need to investigate and communicate their plans together with the laws and regulations of the government. Data is a sensitive topic with a lot of potential towards Artificial Intelligence (AI) and 'deep learning', the value and ownership should be defined. As most OEM's are currently still holding data within the vehicle, autonomous and connective technology need data from the car in order to succeed. People are already giving a lot of data to companies (e.g. Google or Facebook) and companies use this to enhance customer experience. The biggest issue is that people currently do not know which company has what kind of information on you and what is it used for.

LEVEL OF AUTONOMY

Research agrees with tactics that levels of autonomy (as explained in Chapter B4) should be skipped as participants of only partly AV become more involved with in-vehicle entertainment, had increasing levels of fatigue, and affording less visual attention to the road (Jamson, Merat, Carsten, & Lai, 2013). This means that if the driver is not responsible for the driving task, he/she will quickly divert his/her attention to other activities. For an example, click the following link for a demonstration. Therefore, some (e.g. Ford and Google) OEM's chose to skip level three of automated driving as others chose to pass every level (e.g. Tesla and Volvo).

LIABILITY

In the current situation, the driver is responsible for any damage he/she inflicts to an object or person. The driver often has insurance to cover these costs but can face criminal charges when intentionally inflicting damage. It is assumed that hardware or software failures can also occur with AVs, but they are more safe and reliable than human driven vehicles (Lipson & Kurman, 2016; Maurer, Gerdes, Lenz, & Winner, 2016). AVs will have no driver to be liable for these damages. Research states that if the user of the vehicle has no chance to intervene, he/she cannot be held responsible (Hevelke, Nida-Rü, Hevelke, & Nida-Rümelin, 2014). Like mandatory liability insurance now, Hevelke et al. (2014) suggest the same principle for AVs. Specifics need to be negotiated between insurance companies, car manufacturers and the government to create a feasible liability system.

DILEMMA SITUATIONS

It will be inevitable to remove all human errors in transportation (e.g. bicycles, pedestrians) so there are likely chances that an AV cannot calculate itself out a collision. The AV still has to make trade-offs in these 'unavoidable events' in which damage is inevitable (Maurer et al., 2016). Research states different dilemma cases that need attention (Maurer et al., 2016):

- Wildlife. What should an AV do when confronted with sudden wildlife on the road? There probably will not be enough time hand control over to the driver. If the cars maneuverers away from the animal, it will cause fatal damage to the driver. In this case, programmers of AV should probably design the vehicle to kill the animal. What if the animal is a bear with a family with resembles a human family? What if there are children in the AV?
- Self-sacrifice. If someone wants to commit suicide, you can imagine there are several cases where the vehicle can …
- Avoiding harm.
- Trolley cases. An often-used case which states that you have two options, let the train run its course (it will kill five persons) or pull the switch (and kill one person). Pulling the switch is an act of killing, while the other one is merely allowing someone to die. Killing means you are directly responsible for someone's death, letting die involves much less responsibility. If we change the numbers to one versus 100, is that a trade-off that should be calculated for?

"Yes, Moore's Law is operative, but so is Murphy's Law" (Lutin, Kornhauser, & Lerner-Lam, 2013), we are still in the early stage of this technology and need to design for ethical dilemmas before they happen (Maurer et al., 2016).

HACKING

Imagine someone (e.g. terrorist, disgruntled employee, hostile nation) is able to hack into the system and program a dormant virus into the system which spread through an entire fleet of AVs. Research shows that cyber-attacks mostly happen to gather new information (Fagnant & Kockelman, 2015). It would require a much more complex and sophisticated attack to be able to control and manipulate the vehicle. Still, software manufactures for AVs should be aware of this threat and limit possible attacks and damages.

Conclusion

In my opinion, the advantages of autonomous technology outplay the challenges (or barriers) that can occur. Autonomous technology creates opportunities for cities to increase their quality of life. More space can be used for green, social environments. Citizens can use their time much more valuable as congestions decrease and they do not have to drive anymore. Moreover, transport will be safer and accessible for everyone.

Although development and implementation of this technology still face several challenges, Ford has the opportunity and the responsibility to use this technology for the betterment of the city. In the next chapter, I will explain the business side of this technology.

E. VISION OF OTHER COMPANIES

Several agencies and technology companies are also trying to get a grip on the future (see Figure 59). Although some focus points are different, they all share the believe that the city of tomorrow is an improvement towards a healthier, and more comfortable world.

The biggest impact that the new direction of Jim Hackett is that Ford is changing from a product-based firm towards a service-based firm (offering mobility as a service), this change is also called, servitization.

Figure 59. Future vision of other companies

F. TREND RESEARCH

Trends research is becoming more important in the discipline of design as the ability for future foresight is becoming more valuable with rapidly rising technological innovations (Evans, 2011). This trend research is a first step towards looking for possibilities in a vision for future urban mobility (see Figure 60 on page 163 for a visual representation of the trends research).

"By accepting that the future is not pre-ordained, the more effort spent trying to understand the future, the more possibilities we may be able to shape." (Evans, 2011)

A development is something that is currently already taking place. Trends are a general direction in which something is developing or changing but has not done so yet. Therefore, it is hard to imagine the impact of a trend. Although a general feeling of the future is needed in order to design for it.

For trend research prior of creating a vision, design methodology from Evans (2015) is partly used in order to gain a view of the future (see Chapter A5: Design Approach).

General trends

The biggest drivers for now and the future are technological trends. Through the Internet of Things (IoT) and online platforms, knowledge and opinions is easily shared globally. Therefore, socio-cultural movements are easier created in order to – for example – rise political awareness and action. A lot of trends evoke reaction which can also be seen as trends. Some reaction trends are mentioned if viewed valuable.

HEALTHY PEOPLE

With obesity becoming a global issue, a counter movement is getting more traction: healthy food! People are getting more and more aware of what they are consuming and in what circumstances that is produced. Also, online sport movements (e.g. fit girls) are very popular. However, this creates a wrong self-image therefore also causing insecurity.

INDIVIDUALISTIC

As already somehow explained in Chapter A4: Meaning of value creation, an identity crisis is common in this time. From a local catholic farmer towards a citizen of the world: it is not clear who he/she is anymore. Therefore, individualistic movements are often seen with a mind-set: I am what I contribute to this world. To specify, authentic experiences (Mermiri, 2009) are meaningful, Do-It-Yourself (DIY) practices are valued as you create your own environment (and identity). This creates a participation society.

Slow down movements are also gaining popularity (e.g. mindfulness). With a world filled with endless possibilities, this creates pressure to live effective and efficient in order to accomplish more and more, which gives stress. Time is seen as a valuable essence and should be used efficient.

SILVER SOCIETY

As our healthcare capabilities increase and larger families are becoming rare (3+ children), there will be a larger amount of elderly in our society. Therefore, trends such as home automation, smart sensors, smart assisting clothing are valuable for this age group. As this group wants to be mobile (but often struggle, therefore become lonely), autonomous technology can offer opportunities for this segment.

CERTAIN LIFE

With connectivity and globalization, also opens up a lot of personal data. Your phone knows you almost better than you know yourself and who owns that data? People are demanding more transparency and privacy awareness, not only from the industry but also from the government. Data therefore, is almost becoming a new currency, as data is knowledge.

NEW ECOLOGY

As Eneco calls it: 'Welcome to the new world' (www.eneco.nl), this can be seen as the movement towards a more sustainable world with renewable energy. There are countless initiatives, such as windmill parks, solar powered tech solutions, smart buildings/ materials in order to counter global warming. People are getting more aware of the effects of their interaction with the planet.

GENDER SHIFT

The term 'gender shift' already explains this trend a little. Feminism, gender equity and motivation towards this shift. Effects are polylove (multiple partnered families), female leadership opportunities and new accepted ways to raise your children.

NEW WORK

With the Internet of Things (IoT) and Cloud technology, your work is with you all the time, creating a new work-life balance. Employees are not restricted anymore in a nine to five mentality which gives them much more space and freedom to work when they want to work. A counter movement from this trend is that work never ends, there is always an opportunity to work longer.

KNOWLEDGE CULTURE

As a consequence of IoT, knowledge as globally available (for example with MOOC's). Open innovation shows that knowledge sharing, and collaboration is much more effective than closed innovation inside a company or team. Therefore, open data is created, which can be used for everyone. Privacy is a counter movement which is explained in the trends 'Certain life'.

GLOBALIZATION

Besides the term meaning that the earth is becoming more populated, it also has meaning in economic terms. China as the new economic power, emerging markets such India and global brands trying to decentralize (Kalmbach et al., 2011) in order to create local solutions that fit its users even better and to regain trust.

URBANIZATION

The most fundamental trend for this assignment. More and more people are moving towards the city as it gives more convenience and access. In order for cities to cope with this problem, they have to become smart (see Chapter B3: Smart(er) cities). A consequence of urbanisation is also shrinking cities who are not capable of dealing with the larger amount of people.

MOBILITY

With new technologies (autonomous, electric and connectivity), come new opportunities. Software inside the vehicle is becoming more and more important as the production of the vehicle is not the biggest challenge anymore. Therefore, new players enter the field (e.g. Google, Tesla), creating disturbing noise at existing OEM's. On the other hand, there is a strong movement of demotorization, meaning the new generation does not value ownership of the car as much as they used to (Kalmbach et al., 2011; Kuhnimof, Buehler, Wirtz, & Kalinowska, 2012). In general, this movement is called the sharing economy (e.g. Spotify, Airbnb and Snapcar). Therefore, mobility companies are shifting from a product company towards (mobility as a…) service company.

Other movements from a political level are regulations and laws towards emission free mobility. Vehicles with high emission ratings are not able to drive in designated areas, pushing towards mobility from renewable energy.

CONNECTIVITY

A consequence of IoT development. Trends such as e-commerce, crowd sourcing, big data and smart devices create a grey area between online and offline living (also linked to identity forming: are you your Facebook likes?). This trend crosses several other trends such as the Knowledge culture, New Work and Mobility.

Trend research conducted by Ford

Ford also has done a trends research for 2018. The trends show a clear direction where Ford is heading as a company. Insights can be drawn which will help with creating and aligning the strategy.

What stands out of the trends is a very ethical view on society. Most of the trends are socio-cultural movements from which technology, ecology or politics are the drivers. Ford focusses a lot on social wellbeing. A happy, healthy and equal society, physically and mentally. Ford sees a change in the consumption society and how experiences are more important than material goods.

THE EDGE OF REASON

"Across the world, people are overwhelmed by changes. Politics has turned to chaos in many regions. Trust in institutions continues to crumble. Pop culture is riddled with fallen heroes. People don't know who to trust or in whom to place their hope. There is disbelief of the reality in which we live. The result is a pervasive sense of unease, polarized opinions, a deep questioning of leadership and identity—and a search for inventive ways to cope and adapt." (Connelly, 2017)

THE ACTIVIST AWAKENING

"As cultures become more polarized, people are being jolted out of complacency and galvanized into action. Newly engaged, people are no longer taking their rights for granted. Instead, they are voicing and demonstrating their opinions—from large protest gatherings to small, yet potent, symbolic gestures. Conventional wisdom and expectations are being toppled as individuals debate the change we need." (Connelly, 2017)

MINDING THE GAP

"Worldwide, a spotlight is on inequality. Racial inequity is in the headlines almost daily, and women across the globe are calling for gender parity. To close those gaps, activists and entrepreneurs experiment with new ways to improve access to quality education, increase productive employment, create equitable wage scales, and provide affordable access to basic living standards and infrastructure." (Connelly, 2017)

THE COMPASSIONATE CONSCIENCE

"With an omnipresent news cycle, we can now see, hear and feel the physical and emotional wreckage that victims of crises face across the world. Floods, fires and inexplicable acts of violence offer daily reminders to people of the importance of taking an active role in society. We can no longer ignore sad realities. Instead, we must focus on how we can help ease the pain." (Connelly, 2017)

MENDING THE MIND

"Slowly, consumers and institutions are realizing that you can't have a healthy body unless you have a healthy mind. Anxiety and depression are at unprecedented levels—the

World Health Organization describes it as an epidemic. Among the explanations for this distressing shift is the theory that digital connectedness is prompting us to be less connected to each other. Whatever the reason, mental health is an issue that individuals, governments and companies must address." (Connelly, 2017)

RETAIL THERAPY

"Many consumers are on an endless hunt for something new and different, seeking material goods or experiences that bring happiness. But do they? How do products elevate our sense of happiness? Are online purchases as fulfilling as in- store ones? As timesaving services proliferate, consumers find that they can buy the one thing that was never for sale- time. And brands are finding new ways to fill that time and lure consumers in." (Connelly, 2017)

HELPLESSLY EXPOSED

"Public trust in what companies do with our data has never been weaker—and yet consumers feel there is little they can do to control access to their personal information. Does everyone know everything about us? Big Data claims to be able to interpret our behaviours, which in theory should help consumers, yet it also can come with Big Bias. Now that much of consumers' personal information is available— often without their approval or knowledge— many are scrambling for ways to safeguard their information and hold companies accountable." (Connelly, 2017)

TECHNOLOGIES TIPPING POINT

"Virtual reality, artificial intelligence and autonomous technology—long farfetched notions—are here, and they're already being embedded into our daily lives. This is a preview of what's to come—the good, the worrisome and the bizarre. Across the globe, humans are asking, what does the onslaught of intelligent technology mean for us as a society—and will it make a more positive impact than we thought? The companies building these technologies bear an extraordinary responsibility to create things and services that augment people's lives rather than disrupt them." (Connelly, 2017)

SINGLED OUT

"Are marriage and parenthood still the desired norms for happy living? More and more, people are questioning whether these institutions are right for them. In part, this is rooted in economic necessity—weighing the costs and benefits of marriage and children. But it's also due to changing cultural norms. Today, with more choices and longer life spans to consider, more couples are rethinking the binds of commitment." (Connelly, 2017)

BIG PLANS FOR BIG CITIES

"Today, 54percent of the world's population lives in urban areas— and that number is expected to rise to 66percent by 2050. But to capitalize on the full potential of cities— to keep them happy and healthy places to live—we must be smart and mindful about planning. To stay sustainable as they grow, cities must address the need for mobility, prosperity and wellness. That means creating affordable housing, establishing or preserving green space, and developing an infrastructure that allows people to move freely." (Connelly, 2017)

Also, a clear view is given on distrusting large companies and governments. Therefore, citizens want more involvement and participation. The public becomes exposed through their data and nobody knows who the actual owner is and what they plan to do with it. As technology becomes more embedded in our daily life, the public becomes more dependent and therefore afraid of the consequences.

Finally, Ford also acknowledges urbanization. Not only from a mobility perspective, but also housing, green spaces and prosperity are mentioned.

Figure 60. Visualization of trend research

Health	Individual	Silver society	Centainty	New Ecology	Gender shift	New Work	Knowledge culture	Globalization	Urbanization	Mobility	Connectivity
The counter movement from the fast food industry	How people create their own identity	The rapidly growing elderly population	The movement of people wanting some centainty about things they do not understand	A transition to overcome global warming with new materials and methods	More emphasis is created on equal opportunities for everyone	A change in how businesses can do business	Throught connectivity people can exchange knowledge, making it more accesible	Our planet faces a growth of population	More people are moving to the city	How people or cargo transport is organized	How networks of people are able to communicate
	A person of the world	Growing silver population						Migration Global cities	More grid-lock & congestion	More miles per person Mobility on demand	A person of the world
	Maker - movement Decentralization	Universal design	Industry 4.0 Transparent markets	Sharing economy Fair trade Circular economy		Service economy Permanent Beta Start-up culture	Open innovation Sharing economy Massive open online courses	China industry leader	City type for segmentation	New players Mobility as a service	Crowd sourcing E-commerce
		50PLUS	Transparent governance	Paris agreement Rise of GroenLinks Green investments	Equality				City engagement Transparency	Regulations CO2 & AVs	Wake-up
Package design				Bio-boom Maker-movement Global warming				Global warming	Emission free	Fully electric promises	
Fitness community Foodies	Quality of life Time is value Participation society	Distinction	Technology trust Digital life Privacy	Urban farming	Work - life blending Feminist movement Rainbow families	Work-life balance	Life-long learning			Demotorization Popularity of cycling Car/ride sharing	Peer trust Digital life
Online platform Internet of Things		E-Health Domotica	Big data Internet of Things Open data	Green tech Energy transition		Internet of Things Cloud technology	Internet of Things Open data Cloud technology		Energy transition Smart Cities	Electric vehicles Autonomous vehicles Smart/connected vehicles	Smart infrastructure 5G network Internet of Things Open data

General
Demographic
Economic
Political
Ecologic
Socio-cultural
Technological

G. EXPERTS

Several interviews were held with experts in the field of mobility (see Table 3 on page 77), autonomous driving and city development. The experts were chosen to give a complete view on mobility of the future in urban areas.

Set-up

For the interviews, I used semi-structured interview guidelines. As area of expertise differed, this gave me enough grip to discuss every subject, and enough freedom to steer the interview to individual opinions. The general structure was as followed:

1. Introduction

2. Past

a. History of the company

b. Motivation for founding the company

c. Role of the expert – lessons learned

3. Present

a. What is the current role of the expert

b. How does the company innovate?

c. What are current challenges of the company?

d. Which gap fills the company in the mobility eco-system?

4. Future

a. What are the biggest drivers for change in the mobility sector?

b. How does the expert see the future of mobility?

i. People transport

ii. Goods & services transport

c. How does the expert see the future of cities?

5. Autonomous technology

a. Does the expert think there is a future in AVs?

b. How does the expert think that AVs can influence this future?

c. How does the expert think about technology acceptance for new mobility solutions?

6. Wrap up

Where agreed, interviewed were recorded and analysed (not transcribed). The main insights are stated in the next section.

Results per stakeholder

See table on the next page.

	INSIGHT	INSIGHT	INSIGHT	INSIGHT
TNO	Their role as an institute is to provide knowledge on technological developments and opportunities to improve quality of life. Therefore, I should always think what the added value for the city will be.	TNO explained that a transition is needed for new mobility option. It takes around seven to eight years to change a vehicle in an environment.	Electrification is much more useful for cities than autonomous technology as the health of the city increases more when there is no pollution.	First target of autonomous technology will be in the logistic sector. Platooning is an example which can already be implemented in several dedicated highway lanes.
WEPOD	When people see the added benefit of autonomous technology and they have experienced the safety, technology acceptance will not be a problem.	The WEpod is used to show the public and government that autonomous technology is feasible.	Autonomous vehicles will first be implemented on dedicated areas such as a university campus.	
SMART-PORT	The first implementation for autonomous technology will be platooning.	E-commerce in the logistic sector are rapidly growing, demanding more and more of our current infrastructure.		
CONNEKT	When designing solutions for problems on a personal level (e.g., last mile), who designs solutions on a society level (e.g., obesity)?	Social interaction is a vital part of urban life. Autonomous technology could decrease social cohesion and increase a social bubble effect.	The Netherlands has a very good infrastructure, connectivity and test facilities to implement autonomous vehicles.	We can try to have all regulations and laws ready for autonomous vehicles, but if Europe does not follow, OEMs will not invest.
LIGHTHOUSE	Logistic sector is about 30 percent of all urban mobility.	Eindhoven is very advanced on mobility initiatives and start-ups. They are an example for other cities on their envisioning practices.	Make sure you create a complete overview of your value proposition before you try to align stakeholders.	Timing is always a challenge when creating roadmaps. Therefore, talk to new initiatives to get a grip how fast technology is developing.
SUNIDEE	With new technologies, there are so many options and implications for mobility that everyone wants to be involved because they do not want to miss an opportunity.	Public transportation is facing multiple threats from emerging vehicle sharing possibilities.		
MOBIKE	The clear vision is to have a bicycle in every city. Therefore, visitors of urban areas are always able to use a bike.	Bike sharing services are not positioned to replace your own bike.	The Netherlands is a very popular bike county with great infrastructure. Every winter, OV-Bike usage stays steady and every spring it rises.	The optimal sharing service still needs to be discovered. In Amsterdam it is currently banned (investigating for new options), and in China there are bicycle graveyards.
GOUDAPPEL COFFENG	Main takeaways where the rising popularity, necessity and dominant transportation modes: biking and walking in cities because there is too little space.	Urban architects approach problems from two worlds: flows and places. Flows meaning how mobility moves in an area. Places meaning the area around the transportation which influence quality of life.	Urban planners divide a customer journey in three parts: (1) smart urban planning (Will I travel and where? What time?); (2) smart networks (With mode of transport?); (3) smart management (Along which route?)	Stakeholder management is a very important part of their process as shops, living areas, main hubs and municipalities are all influenced by the design of infrastructure.

H. INSIGHTS PER STAKEHOLDER

Set up

As my assignment first focusses on creating as much value in the ecosystem of urban mobility, I approached the stakeholders as a graduation student from the technical university of Delft. The reason for this is that I did not want stakeholders to already be primed for autonomous technology with Ford from the beginning.

1. Introduction
a. Motivation for my research
b. Explanation of roles within the company
2. Presentation
a. Small analysis of different variables
b. Trends
3. Future
a. Too little space
b. Pollution
4. Vision
a. Different zones
b. Different mobility users
5. Opportunities
a. Introduction of Ford within my research
b. Autonomous technology
6. Wrap up

At every meeting, I would (try) to visualize their insights immediately into the 'Praatplaat'. As it was hard to focus on the conversation and the visualization at the same time, visual iterations were often made after the session.

Results

The results are analysed and mapped with the following variables: (1) motivation for change, (2) added value in ecosystem, (3) future focus, (4) opportunities.

FORD

(1) As Ford is the driver behind this assignment, they are very motivated and are heavily investing for changes in the mobility ecosystem.
(2) Currently, Ford add value to the ecosystem by the design and production of motorized private and commercial vehicles.
(3) The vision of Ford (Chapter B4: Ford's vision) clearly explains the added value of new technological opportunities in the mobility ecosystem. Ford wants to democratize mobility, giving the streets back to the community.
(4) Ford is currently investing in multiple opportunities for autonomous technology. Examples are ride haling and goods delivery services.

NS

(1) With urbanization, NS sees the necessity to grow as they need to build for peak hours (about 24 hours a week). As they are places in the city centers, growing is a challenge as space is limited.
(2) The NS is responsible for mass public transportation (train) in the Netherlands. Currently, this kind of transportation is mostly used to travel across cities and less within cities.
(3) The NS focusses on growing their main hub instead of growing sub hubs in outer city areas. The NS does not think rails will go underground in urban areas as these are to large investments. They see infrastructure for pedestrians and cyclist will be improved around the hub.
(4) The NS does not see autonomous technology as a threat or an opportunity for rail transportation. They see autonomous technology as a mode of transport that will go where current public transport cannot go. All investments for 2030 are already made and NS is currently looking towards 2050. For Ford, interesting is the first and last mile transportation.

EINDHOVEN

(1) Eindhoven is already on top of new mobility solutions to overcome congestions and pollutions, increasing quality of life in Eindhoven, making it a vibrant technological brain-port in the Netherland. Although far ahead, they acknowledge that they have to keep innovating and changing towards a sustainable future.
(2) The municipality has a vital role in the ecosystem as they are able to create opportunities for new technological implementations. The municipality decides which regulations, laws and investments are authorized and can be tested in the urban area. New mobility innovations depend on these authorizations.
(3) The main focus point for Eindhoven is to become emission free (Eindhoven does not have the problem of space as much as other cities). Still, they see a lot of opportunities for autonomous technology and are eager to collaborate with other parties. Also, the municipality is learning more and more about the participation society and co-creating together with citizens.
(4) The municipality is investing in new infrastructure and want this to be future

proof. This infrastructure will be a connection between popular industrial areas. Also, Eindhoven wants to be more involved in looking for opportunities with Ford.

PRORAIL

(1) ProRail wants to innovate but has difficulty with this as politics majorly influence their directions. A public transportation vision for 2040 is created which has interesting insights for public transportation is a whole.
(2) ProRail is responsible for the maintenance and changes on the railways and stations. They work close with, for example, NS (which is the company that uses the rails with their trains) to provide public transport. ProRail determines (with stakeholders) where new stations are places and infrastructure should be improved. Therefore, they can decide where mobility can be increased or decreased (decisions are often considerations and dilemma's).
(3) ProRail understands to value of collaborating with other mobility providers in order to align mobility for users. They see a shift from a divided public transport and individual transport, towards mass collective transportations and local customized mobility.
(4) As of this moment, ProRail is a reactive organization, providing improvements for existing problems. ProRail wants to be more assertive and predict problems in order to stay ahead. Therefore, they want to collaborate with other parties. Ford can be a valuable partner for public transport in this vision for the facilitation of local customized mobility.

PICNIC

(1) Picnic is a start-up (or scale-up) that is currently trying to disrupt the grocery market. Therefore, change and innovation are in the core and do not see this as something they should invest in.
(2) Picnic adds value to the mobility ecosystem as they are a promising goods delivery service provider. Picnic is an example of new innovations that show possibilities in digitalized services. Picnic is a commercial company; their aim is to make profit by providing services for citizens of the city.
(3) The focus of Picnic is mostly robotising and automating processes within the company as profit lies in the decimals. For delivery, Picnic highly values the delivery person as this is their only face to face contact they have with customers. They do not see this step being changed by autonomous vehicles.
(4) Although Picnic does see opportunities for autonomous delivery, they have optimized their delivery vehicles a lot. Ford could look into options for autonomous vehicles which still have people for the customer service.

DHL

(1) DHL is very committed towards radical innovation from a delivery perspective. Examples are bike delivery, electric vehicles and autonomous vehicles. Profit is in the small numbers/seconds, every part of the design can influence this. Therefore, DHL is trying all kinds of vehicles. The Netherlands serves as a pilot country because everything is close together and we have a reliable

Telekom network.
(2) DHL is the biggest delivery company in the world, therefore, creating a lot of impact on customer services and global sustainability. DHL is a valuable partner for industry and people as they see the shift towards e-commerce growing.
(3) The future of DHL is focussed on sustainability at first and they are very proud of what they already have accomplished. Their plan is to innovate also in urban delivery. Within the inner ring, they see one truck of freight going into the city, and from there, pick-up points will be available and bicycle delivery. In other parts of the city, DHL sees autonomous vehicles as a big opportunity. DHL sees no future in drone delivery as it takes to much energy to deliver one package.
(4) Ford is currently already working together with DHL for autonomous vehicles. As both parties see opportunities, they should further invest and test possibilities together with the municipality of Eindhoven for example.

"We are fully investing in autonomous technology" – Marijn Slabbekoorn (DHL)

HAAGWONEN

(1) HaagWonen is very committed towards a sustainable future. As a social housing cooperation, they work closely with municipalities to accomplish emission standards. For this reason, they are also involved in urban mobility as this could increase the quality of life for HaagWonen customers.
(2) As a social housing cooperation, HaagWonen has a very social and ethical role in the city. They try to involve themselves as much as possible in urban innovation to increase the liveability of The Hague, trying to match target groups to destinations (e.g., elderly close the healthcare institutes). Therefore, HaagWonen always tries to put the citizens first, this is often difficult as they have to deal with multiple stakeholders (e.g., the municipality).
(3) HaagWonen focusses in the future on gas-free housing, efficient parking and green zones. They see efficiency in building higher, but that increases loneliness and anonymity, therefore, increases criminality. Collaboration between different parties that provide maintenance and transport can be much more efficient.
(4) For Ford, HaagWonen can be an interesting party for the commercial vehicle market. HaagWonen maintains a lot of assets in the city. Contractors and movers are important stakeholders for them to cooperate with.

POSTNL

(1) PostNL used to be a government funded organization that was responsible for mail delivery. This is still visible in their DNA as PostNL values high customers service, which over time, created a social role in neighbourhoods. Two camps exist, one which pushes for innovation (delivery without deliverer), to other holding on to their differentiating value of social responsibility in neighbourhoods.
(2) PostNL is the largest delivery company in the Netherlands, being in every street, every day. Their value is the same as DHL (provides

delivery services for industry and citizens), but also provide a social value. Examples are decreasing loneliness by visiting elderly or handicapped for a cup of coffee and checking if the curtains are opened at grandma's house.
(3) PostNL is less open to sharing their innovative directions as it could cause massive demonstrations. What I gathered is that sustainability is not a question, autonomous delivery is something they are investing in, ownership of data is an important point for them, pick-up points are being tested and smart-locks or doors are an area for PostNL where they see opportunities.
(4) For Ford, PostNL is a very interesting partner in the Netherlands. As mail delivery decreases and package delivery increases, bicycles could not be able to transport everything. Therefore, autonomous delivery vehicles could be interesting. PostNL, DHL and Picnic all have difficulty getting enough delivery personnel, autonomous delivery could help them.

SPAARNELANDEN

(1) Spaarnelanden is responsible for waste management, parking and mobility services in Haarlem. They are motivated to change towards electric mobility and finding solutions for the shortage of parking spaces.
(2) Spaarnelanden is the arms and legs of the municipality, they are closely in contact with the people. Therefore, they really see and feel the participation society and work towards local solutions. They fulfil a very social and practical role in the city. They see the added value of strategies and visions of management but believe stronger in talking to the people themselves in communities.
(3) For waste management, Spaarnelanden wants to create more underground storage in neighbourhood for a longer period. They want to provide press machines within for more efficient use of space. For parking, they see car sharing services as feasible options and are starting first tests in April. Guidelines for people using such service is that they get rid of their second car.
(4) Spaarnelanden was very enthusiastic about Ford's vision and giving the streets back to the community. This aligns with their own vision. Therefore, Ford can collaborate with them for possible implementation of car sharing services (e.g., Chariot).

ARRIVA

(1) Arriva sees valuable changes in optimization between mobility stakeholders as this is often not efficient. Also, sustainability is a large driver for change.
(2) Arriva wants to add value to the ecosystem by providing mass public transport to increase the quality of life in urban areas. Arriva works closely with municipalities in order to offer this service.
(3) For the future, Arriva sees changes in hubs and transport. Busses are more and more removed from downtown areas. This increases liveability (e.g., less noise and pollution) but decreases liveliness as mobility is more depending on walking and biking. Also, busses are more and more located at the back of stations, not in the view of people. Arriva confirmed that bus transportation is changing. Currently, busses go everywhere to minimize first and last mile. In the future, busses drive in a 'tram-like' mode, where more busses drive over a faster track, not going to less dense living areas. This movie shows Arriva's vision very clearly.
(4) Arriva can be a valuable partner for Ford to increase urban mobility. Arriva did not see autonomous technology as a threat for their business, but it could deliver a service with added benefits for public transport. Especially, first and last mile coverage in spaces where busses are not going to drive anymore (white areas).

RIJKSOVERHEID

(1) The Rijksoverheid has the responsibly to look for options to improve the quality of life in the Netherlands. Therefore, they have a wider view than I had for this project. Their job is constantly think about the future. Therefore, the Rijksoverheid always want to change to improve.
(2) As I did research on improving mobility in future urban areas, the Rijksoverheid adds value by doing this on a national level. On this scale, they constantly balance options, trying to design and improve quality of life in the Netherlands.
(3) The Rijksoverheid also sees disruptive changes in the ecosystem with a lot of opportunities, but also dystopian views. Therefore, they try to align municipalities and influence politics in order to create their imagined utopia.
(4) Although their first priority was electrification, the Rijksoverheid also sees opportunities in autonomous technology. Only, they approach is a very top-down approach. Therefore, no concrete possibilities were discussed. They just steer towards their vision of less pressure on the infrastructure and less pollution.

I. SUB VISIONS

As this assignment is complex and involves multiple stakeholders and variables, an overview is given in which level each variable will be involved in the vision.

Different city stakeholders

In the mobility system, there are several stakeholders) that have influence on changes within the system. Each their values are descripted in chapter B1: Analysing different stakeholders, and their job is to make sure that all mobility users (next section) can use the mobility infrastructure as good as possible.

In the vision, these stakeholders' values are implemented, but not directly visible as they are not players in the field, but the creators of the field itself.

Different mobility users

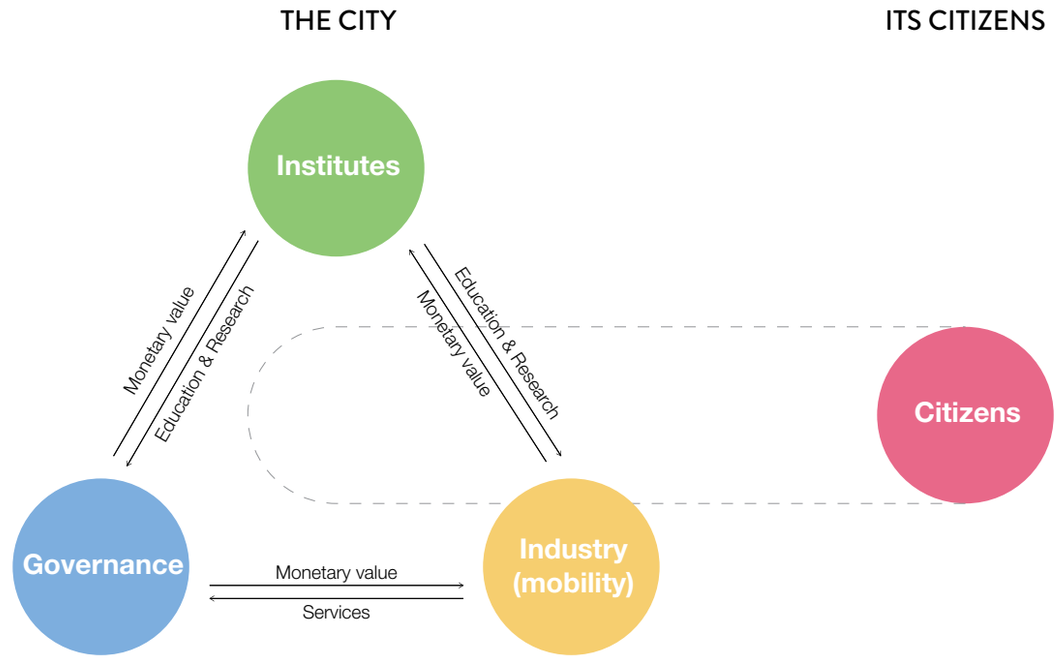
There are three different mobility users (see page 70: Users of the mobility system) as described in Chapter A1: Analysing the system, where the stakeholders mentioned above make sure that these three users, are able to benefit most from the system.

Mobility users are directly visible in the vision, as their needs are being solved through radical innovation, implemented by the stakeholders of the mobility system (page on the right: Stakeholders of the mobility system).

Different city zones

The environment in which the users operate has different zones within a city. Chapter B3: Analysing the urban environment, describe the differences of these zones. Mobility users face different challenges in different zones and mobility solutions should be tailored accordingly.

The differences between zones are clearly visible in the vision and new innovative mobility solutions can be communicated clearly.



In 2030, urban areas are still increasing in density of population, resulting in challenges to ensure a safe and healthy environment. I think that cities have to embrace new technologies in order to create order out of chaos, ensuring a certain quality of life for everyone.

Example quote of a city: *"I want to make sure that everyone has access to fast internet"*

Challenges:
- Large organizations have trouble moving and responding quickly. The municipality of a city needs to be able to act quickly, though guaranteeing quality of service.
- Ensuring is certain quality of life is the city eco-system is complex because there are multiple target groups (citizens, industry, institutes). A value map could be useful for the city to balance the system.

In my view, people are shifting towards a priority in value of life, instead of life length. People want to be included in the creation of their own environment and therefore, their identity. Willing to participate and co-create, they demand more flexible and efficient solutions that enable them to do what they want to do.

Example quote for people: *"There are so many fun things to do here, I don't want to waste time in traffic jams"*

Challenges:
- People are not aware of the possibilities and impact they can have on their environment or do not know which initiatives they should contribute to.
- Creating an identity is a very individual and iterative process in which people may change their behaviour. Therefore, it is hard to predict where people want to add value and meaning.

MOBILITY USERS

With globalization and urbanization, more traffic accidents, pollution and congestions arise, making mobility expectations hard to ensure. I think that autonomous & electric technology is able to solve a large part of these problems. More flexible urban solutions are possible through ride sharing, preserving the feeling of control, independence and freedom, democratizing mobility (as a service).
Example quote for mobility as a service: *"It does not matter who wants to travel where and when, it is my responsibility to make sure everyone can use my services."*

People

Licenced — Unlicenced

When transporting people, I believe that safety is the main driver for innovation, in- and outside the vehicle. In 2030, mobility should be comfortable, facilitating people in what they want to do with their valuable time. It should enhance peoples feeling of freedom, independence and control over their lives.

Example quote for people mobility: *"I have multiple arrends I need to make with or without luggage, the mode of transport that I choose is safe, flexible and comfortable."*

Goods & Services

Product — Service

Delivery services still lack the connection with the user, causes discomfort and inefficiency. Therefore, I think that in order create a valuable delivery service, the good/service that is delivered, does not need to go to the user, but they both need to go together in an efficient and comfortable way (another possibility is that the user does not need to be present anymore). Every time an appointment is made, responsibility from both parties is required for delivering a good or service, which is seen as discomfort.

Example quote for goods and services: *"If I need to make an appointment for every trip I make, I feel really dependant and stuck in my planning."*

Maintenance

Onroad — Offroad

Maintenance is still a very large and important part of urban area and I think that in 2030, it will become even more relevant. When everything is connected and communicating, it is vital that the system stays up to date and has high workability, else stakeholders will stop using it. In order to accomplish this, accessibility and a safe work environment are key enablers for efficient and quality maintenance.

Vision per city zone

ZONE A: DOWNTOWN

Key terms: High density, open, healthy, room efficient, pedestrian's dominant
Zone A is the heart of a city which facilitates shopping, food & drinks, cultural activities, social meeting spaces, touristic attractions and possible multinationals. Besides functioning as a living area, zone A also functions as the main hub for the city. Zone A fulfils different functions through the week: (1) daily activities, (2) free-time activities, (3) weekend activities. Zone A is able to accommodate large amounts of pedestrians that travel through public transport in and out of the city.

As this is a very popular part of the city, space is a valuable good. Therefore, mobility solutions should overall be space efficient. In Zone A, the pedestrian is dominant and has priority over other mobility modes. This way, more space is created, and pollution of transport is minimalized.

The ring around Zone A has the main function of providing transportation within distances in Zone A that are not comfortable for pedestrians. I think this is an interesting part for autonomous technology (and perhaps an autonomous pod). It is important that this pod visits main hubs of the city (e.g. centre station).

Challenges:
• Create a zone where most destinations are available by foot.
• Create a zone where open mobility is provided for different weather conditions.
• It is important that maintenance can still be provided in this area.

Figure 61. Example of Zone A in Eindhoven

ZONE B: PRE-WAR

Key terms: Middle density, semi open, bike dominant
Zone B is a fuzzy zone with different functions and multiple sub centers (small shopping areas). This area is mostly used for daily activities (e.g. errands). I think that urbanization creates the largest mobility challenges in Zone B as is it is not built for that kind of density. Therefore, in 2030, the bicycle will be the dominant form of transportation is this area.

A reaction of a bicycle dominant zone is that cars are not efficient of wanted in an area. Therefore, the ring around Zone B is vital for cars to manoeuvre around this zone. Where the ring is still available for ownership vehicles, autonomous pods can have great possibilities for times when citizens needs to cross in bad weather or when carrying cargo (e.g. groceries).

Challenges:
• Even bicycles can take in too much space in a dens city. Create facilities and bicycle mobility solutions to overcome bicycle graveyards.
• Create a zone where open mobility is provided for different weather conditions.
• It is important that maintenance can still be provided in this area.

Figure 62. Example of bicycle dominant infrastructure

ZONE C: SUBURBS

Key terms: Lower density, closed, car dominant
Zone C is the outer city zone that is created a comfortable environment for the car. This zone facilitates most of all the living areas of people living in the city. I think that ownership of the car will still be a very important part of mobility modes as it has unique values, such as independence, freedom and flexibility. As Zone C links to city to the county side and the highways, this is the place where cars stay dominant. Other mobility options are still welcome, such as bicycle highways (especially with electric bicycles), see Figure 63: Example of bicycle highways.

I believe that if people are going to choose shared mobility over their own car when entering the city, transition points need to be made accessible and efficient. Making an appointment with a mobility service creates responsibility at both points, with decreased flexibility and freedom for the user. Therefore, transition points need to be available all the time, such as the internet.

Challenges:
• Transition points need to be able to serve for different mobility needs for different users, such as a person who just visited IKEA, or a construction worker who is on his way home.
• Create an open network where different players can offer different mobility options.

Figure 63. Example of bicycle highways