Responsible Technologies in Public Spaces

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Acknowledgment

This graduation project marks the end of a two-year journey and the beginning of an exciting future. Past two years have been very special, the experiences that I have had, the people that I have met, have taught me a ton of things. Though it feels like it was just yesterday that I had just landed in the Netherlands. Time really flies.

This project was nothing short of a roller coaster journey of its own and I know the learnings from it are going to play a big part in my future. This project would not have been possible without the endless support of many people and I would like to take this opportunity to express my sincere gratitude to them.

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Kind Regards,
Siddharth Daswani
Summary

History has taught us that not all innovation is good innovation. Just take for example the ecological devastation the DDT and the carcinogenic asbestos have caused. The advancement in new technologies like AI, IoT, autonomous robots and big data brings with it plenty of uncertainties, risks and ethical questions that need answers to if we wish to reap their benefits safely. We need these technologies to tackle some of the greater challenges of your society (like sustainability) but at the same time, we require ways to know how they should be deployed responsibly. This project focuses on the responsible deployment of technologies in the city of Amsterdam and this project has been done in collaboration with the Cities of Things Labs and the AMS institute.

The project starts with an initial problem statement of “How can the “Principles for Accountable Algorithms and a Social Impact Statement for Algorithms” be used to develop a strategic framework for responsible AI innovation in Amsterdam” and to answer this question a literature review was done, Municipalities were researched, perception of the citizens were researched and in order to understand the relation of devices to the city a technology called Scan Cars was researched.

Later in the project, the initial problem statement was reformulated into a change statement. The formulated change statement was “I want citizens to get well informed about what data collecting devices are doing in public spaces so that citizens can help authorities decide what is best for them” the value of transparency and the ladder of citizen participation were seen as means for achieving the above statement.

The final design that was developed is a mobile application that shows citizens where the various data collecting devices are around them in the city, what actions do these devices take after they collect the data, how do the devices work and it gives citizens the opportunity to respond to these devices by either asking a question, giving feedback or participate in programs that work to improve the way of working of these devices in the city.

In order to ensure technologies responsible usage in the city, it is important to reduce as many uncertainties about the devices as possible. This can be done by making sure every citizen has the channels to ask questions, give feedback and even raise their voices against these devices anonymously. It is also part of the municipalities “inclusive digital city” ambitions and interests to work on such platforms.

In conclusion, the application is one such channel that the city should be developing for informing and empowering their citizens and the recommendations given in the report can be the first steps for fully developing the application.
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Chapter 1. Introduction

Content

1.1 Project Setup
1.2 Project Context
1.3 Prior Work
1.4 Problem Definition
1.5 Methodology
1.6 Conclusion
What will you read?

This Chapter introduces you to the projects context, its scope, the initial problem statement and the methodology that was used during the project.
1.1 Project Setup

This graduation project has been done in collaboration with the Cities of Things Lab (part of delft design labs) and Advanced Metropolitan Solutions Institute.

Cities of Things Lab is part of the Delft Design Labs initiative from the TU Delft faculty of Industrial design engineering that investigates how the future of our desired cities can be shaped with the “intelligent things”.

Amsterdam Institute for Advanced Metropolitan Solutions institute (AMS institute) is a public-private institute that focuses on educating, researching and developing solutions for challenges in urbanised metropolitan areas around the globe.

1.2 Project context

In recent times we have seen a rapid advancement in technological innovation and this improvement has meant that they have now become easily accessible, cheap and deployable. Within the context of our cities, we have seen the use of such technologies in the form of smart city initiatives which have made them better connected and this has meant that we now have significantly better energy distribution, decreased traffic congestion, better air quality and streamlined trash collection as few benefits that this new form of connectivity has brought us.

Even though this pervasive use of technology has brought us many intended advantages, we have also learnt that these very technologies can have harmful unintended uses and consequences as well. For example, the Facebook-Cambridge Analytica data scandal which showed us how social media data can be used in its inadvertent ways for political gains. Another one of these would be the recent bias found in the algorithms of Amazon’s hiring system. Therefore, technologies, in general, can not be seen as neutral or just as an external artefact (Weizenbaum, 1977), they are constantly shaping our behaviour and our world around us. And innovation alone can not be seen as positive, and technologies inherently can not be assumed to be safe and secure. We need our technologies to tackle some of the critical problems of our world but at the same time, they need to be used responsibly so that they are ethical, safe and sustainable.

The context of this project is focussed on the city of Amsterdam and use of a technology called Scan Car by the municipality has been studied closely in order to better understand how deployment and use of similar tech take place in cities.
**Scan Car**

Scan Cars can be described as camera-equipped cars that are being used by the municipalities to issue automated parking fines to vehicle owners who either park their vehicles at an illegal spot or not pay for their parking tickets. Similar uses of cameras and image recognition are now being investigated for a range of new use cases such as detecting trash on roadsides and automatically taxing businesses for storefront advertisement.

![Scan Car, Source: Bd.nl](image)

**Stakeholders**

The Scan Car and related future use cases touch upon the interests of many stakeholders, such as citizens, authorities, and businesses/organizations.

![Primary stakeholders, Source Author](image)

The use of AI in scan cars will affect citizens (and businesses) in a direct and indirect way. Increasingly, citizens and businesses will be subject to automated decision making systems that are complex to understand and whose decisions are difficult to appeal. From the authorities, the Municipality is responsible for deciding for what and where this technology will be used and how it will be monitored and governed. Lastly, Scan car technology developers and manufacturers have a key role in determining the overall functionality, appearance, and user experience, as well as specifics of data collection, data management, data analysis and algorithms.
1.3 Prior Work

The Municipality of Amsterdam has developed a Digital City Agenda (Gemeente Amsterdam. 2019) that outlines a vision that describes the kind of digital city Amsterdam wants to strive towards. That is a Free, inclusive and a creative city. Along with the Digital City Agenda a manifesto called TADA (Amsterdam Economic Board. 2019) has also been developed that lists six principles that can lead to a responsible digital city. There have also been extensive discussions and initiatives with respect to AI: Amsterdam Intelligence (Gemeente Amsterdam), the use of algorithms: Grip on algorithms (Gemeente Amsterdam), 5G and blockchain. Apart from the work done by the municipality, there is also a vast array of literature on smart cities, digital technologies and AI. This thesis will touch upon some parts of it.

With regards to Scan Car, there has been some work done by UNSense (UNSense), who have looked at the possible future use cases and indicated a range of possibilities for tackling potential ethical and social issues surrounding Scan Cars. However, this work has not been validated with stakeholder interests and especially lacks a clear understanding of how citizens perceive and experience digital technologies like Scan Car in their city. The current body of work, that has proposed AI guidelines (European Parliament. 2019, A., Hashmi. 2019) including the TADA manifesto (Gemeente Amsterdam. 2019) for responsible use of technology can be seen as high-level principles which lack clarity on how these principles can be applied in practice.

Figure 1.4: Tada manifesto and the digital city agenda
Sources: Amsterdam economic board. 2019, Gemeente Amsterdam. 2019
In particular, it is unclear

1. How can citizens be included in the design, evaluation and assessment of such projects and
2. How the municipality can embed ethical criteria in the commissioning of digital products and services and ensure that developers and manufacturers take ethical criteria into account when developing and providing such technologies.

This aim requires research on several levels:

- How does the municipality commission, purchase and contract scan cars or similar technologies?
- How does the municipality govern and assess the value and impact of scan cars or similar technologies?
- What are the attitudes of citizens with respect to the use of intelligent technologies in public space?
- What are valid and useful principles from design and responsible innovation that can inform the development of the answer to the question of how responsible use of technology in public space looks like?
- How can the responsible design for municipality, citizens and other stakeholders be assessed?

A recent proposal on "Principles for Accountable Algorithms and a Social Impact Statement for Algorithms" by the FAT/ML research community (Diakopoulos et al. 2017) provides a useful starting point for developing a missing systematic approach.

The key driving question for this project thus is: How can the "Principles for Accountable Algorithms and a Social Impact Statement for Algorithms" be used to develop a strategic framework for responsible AI innovation in Amsterdam.
The methodology was inspired from some of the methods shown in the image. Design tools from the methods that have a social perspective were chosen. For the research phase (Diamond one), to better understand what attitudes citizens have towards different technologies including Scan Car in their city, context mapping techniques from Participatory design and transformation design were used. For the design phase (Diamond 3) an effect driven design approach from the social implication design (Tromp & Hekkert, 2018) was used. This means a societal improvement that I as a designer wish to contribute to was defined which led to the final outcome. This kind of approach is opposite to some of the other responsible design methods that are out there like value-sensitive design (Friedman et al. 2006), practice-based design(Shove watson et al. 2007), constructive technology assessment (Schot. 1992), in which technology or a predefined outcome is taken as a start point for exploring and then determining the consequential effects.

Figure 1.5. Four methods for design for values, Source. Pieter E. Vermaas et. al. 2015

Figure 1.6. Design methodology, Source. Author
Part one
Analysis - Synthesis
The diamond one involved conducting research and presenting the insights of the research. Analysis (research) constituted of doing a literature review, conducting interviews to better understand Scan Car and Municipalities and facilitating a generative session with some users to better understand their perceptions with regard to the technology and context. The questions that were investigated have been described in the beginning of the Analysis section. Synthesis involved presenting the insights in the form of design directions.

Part two
Explore - Change statement
This phase of the project can best be described by the co-evolution of the problem-solution model proposed by Kees Dorst. Which talks about an observed phenomenon, it states that the link between the interesting information of the research and the problem becomes clear with an idea (creative insight).

Figure 1.7: Creativity in the design process: co-evolution of problem–solution, Source: Kees Dorst. 2001

Here S(t+1) and S(t+2) have been named as explore, where ideation is done in order to find the coherence between the research and the problem. Lastly, the change statement describes the societal change that will be strived for.
Part three  
Concept development - Validation  
An Idea representing the change statement was developed using the knowledge from the literature and the developed concept was validated with experts.

1.6 Conclusion

This chapter provided an overview of the thesis context, its scope, focus and the methodology that was used.
Part 1
Analysis - Synthesis
About Analysis

The analysis starts with the main research question and the sub-questions that were identified for it have been mentioned below. Answers for the product analysis and municipalities were found using interviews and questions regarding user research were found by conducting interactive sessions with citizens.

How can the “Principles for Accountable Algorithms and a Social Impact Statement for Algorithms” be used to develop a strategic framework for responsible AI innovation in Amsterdam?

Some of the sub-questions that were identified are:

Chapter 2: Literature Review
What is the context around technologies in public spaces?
What kind of Digital city does Amsterdam want to become and why?
What are some of the proposed ethics guidelines?

Chapter 3: Product Analysis
How do Scan Cars function?
How does the municipality commission, purchase and contract scan cars or similar technologies?
How are technologies like Scan Cars developed and deployed?
How does the municipality govern and assess the value and impact of scan cars or similar technologies?

Chapter 4: Municipality
How do they approve digital projects?
How do they involve citizens in their projects?
How are ethical discussions initiated within the municipality.

Chapter 5: User Research
How much do citizens know about the different technologies in their cities?
What are their attitudes and perception towards these technologies?
What concerns do they have?

About Synthesis

All the insights from the analysis phase have been presented as design directions that can be pursued further.
Chapter 2. Literature Review

Content

2.1 Introduction
2.2 Method
2.3 Smart Cities
2.4 Amsterdam: Digital City Agenda
2.5 Responsible Innovation
2.6 Responsible AI
2.7 Amsterdam Intelligence
2.8 Conclusion
What will you read?

This chapter presents the literature review that was done to find answers to the questions identified. This Chapter concludes by presenting the key takeaways that were found from the literature review.
In this chapter a literature review was done to find answers to the following questions:

- What is the context around technologies in public spaces?
- What kind of Digital city does Amsterdam want to become and why?
- How can we work towards a responsible AI?

2.1 Introduction

The google scholar search engine was used to find relevant articles and some of the keywords that were used are “AI Ethics” “Responsible technology” “ Responsible innovation” “Smart cities” “Applied ethics”. Documents published by the Gemeente Amsterdam and European union relating to the topic were also scoured through.

To understand the context of “responsible technologies in public spaces” research was done on various topics related to the domain. To understand the topic of “technologies in public spaces” the concept of smart cities was researched. Next Amsterdam as a digital city was researched to understand the type of digital city it was working to become. After this to understand the discussion surrounding “responsible technology” AI and the ethics of its use was researched.

2.2 Method

The google scholar search engine was used to find relevant articles and some of the keywords that were used are “AI Ethics” “Responsible technology” “ Responsible innovation” “Smart cities” “Applied ethics”. Documents published by the Gemeente Amsterdam and European union relating to the topic were also scoured through.

Keywords on google scholar + Published reports

To understand the context of “responsible technologies in public spaces” research was done on various topics related to the domain. To understand the topic of “technologies in public spaces” the concept of smart cities was researched. Next Amsterdam as a digital city was researched to understand the type of digital city it was working to become. After this to understand the discussion surrounding “responsible technology” AI and the ethics of its use was researched.

2.3 Smart Cities

Here some of the smart city initiatives around the were looked up and the importance and criticism such initiatives are receiving were researched. Smart cities can be described as urban areas which collect a large amount of data using sensors to manage assets, resources and services efficiently (Albino et al. 2015). This data is mostly collected by various internet of things(IoT) enabled devices which are spread across the city. These devices collect all kinds of data, data about citizens, devices and assets and this is processed and analysed to better monitor and manage traffic lights, improve waste collection, efficiently use street lights, power grids, utilities, to detect crime (Hollands, R. 2008, Kitchin, R. 2015) and other community services. The collected data is now also being explored to see how it could influence human behaviour through Nudging (Ranchordás, S. 2019) and through the use of persuasive technologies (Fogg, B. J. 1999; IJsselsteijn et al. 2006).

Smart cities that integrate information and communication technologies (ICT) connected with physical IoT integrated technologies have brought many benefits to city stakeholders. For city officials, it has brought a way to interact with communities and a way to monitor what is happening in the city and know how the city is evolving. These initiatives have also brought monetary benefits of reduction in costs, labour, resources and an increase in the quality of services. For citizens, smart city initiatives have made cities safer, cleaner, sustainable and efficient. For example, Madrid has created the MiNT Madrid intelligence/ Smarter Madrid platform (Madrid city council. 2015) that integrates the management of many local services like garbage collection, recycling and green spaces. Copenhagen created the “Connecting Copenhagen” a smart city initiative that focuses on the city’s air quality and traffic management (City of Copenhagen. 2014) and Amsterdams smart lighting initiatives (Amsterdam Economic Board. 2015) have allowed the municipalities to be able to vary the brightness of street lights and better manage traffic.

Commercial companies have also been able to initiate their own projects. Companies like Alibaba, Huawei, Cisco, Google, IBM, Microsoft have had their intelligent cities initiatives. For example, Cisco launched its Global Intelligent Urbanization initiative (Cisco. 2014), IBM announced its SmarterCities (IBM. 2017) initiative that focuses on economic development and better quality of life. Availability of real-time data from public spaces has also led to companies being able to provide better products and services to its customers. For example, a delivery company called Deliveroo is using algorithms on these data to find the most efficient routes for delivering. There are many companies
coming with different kinds of applications for these publicly available data.

**Importance of Smart cities**

Smart cities have started gaining a lot of importance in recent times. To tackle some of the big problems of our recent times that is sustainability, climate change, ageing populations, and inequality, governments around the world have been turning to technological solutions for answers (Page, S. et al. 2003). The European Union (EU) have created many programs under its “European Digital Strategy” (European commission. 2018). The strategy has focussed towards working to build technologies that work for people, to build a fair and competitive digital economy, market and use digital technologies, and also states as to how Europe could be a global digital player. There have been examples of many digital city initiatives around the world; programs have been implemented in Amsterdam, Barcelona, Madrid, Dubai, Singapore, India and in many other cities and countries.

**Criticism**

A smart city has its share of criticism and it must overcome its challenges before it can live up to the promises it holds. A smart city, as a scientifically planned city, strives for constant development and lives under the assumption that efficiency is always desirable and this form of thinking can be seen as unattractive for citizens as they would have fewer ways to participate in how the city should be shaped (Sennett et al. 2012). Large amounts of data have raised many questions regarding surveillance in smart cities. There have been critics who have pointed that in low-income countries smart cities are irrelevant as the majority of the population lives in poverty with having limited to no access to basic services and introduction of smart cities could lead to inequality and marginalization (Watson et al. 2013). If smart cities are planned without taking into account people with accessibility problems like the disabled affected with vision, hearing, mobility and cognitive functions then the implementation could create newer barriers for them (Woyke et al. 2019). If a city is striving to be “smart” then it must learn how to take into account the different values its city holds and give voice to all its citizens so they can express their likes, dislikes and concerns regarding the initiatives that are being taken in and around the city.

**2.4 Amsterdam: Digital City Agenda**

Digital city agenda describes the kind of digital city the city of Amsterdam wants to become (Gemeente Amsterdam, 2019). It outlines its ambitions for the next four years and it provides a few concrete steps towards those ambitions. It recognises the opportunities a digital city brings but at the same time acknowledges the different vulnerabilities of a digital city, things like fake information, cyberbullying, privacy issues to name a few. The agenda talks about a few key questions that they are looking answers for. These questions being: What role can the City of Amsterdam play in the development of the digital city? How can we control our lives in the digital city? How are we, the people of Amsterdam, going to empower ourselves and improve our resilience? And how will Amsterdam ensure that the economic and social opportunities of digitisation are exploited safely?

The ambitions that the city is working towards are:
- A free digital city
- An inclusive digital city
- A creative digital city

**A free digital city**

Amsterdam considers individual freedom and freedom of speech to be of high importance and they want the technology to cherish this freedom. The ambition of a free digital city focuses on protecting civil rights and ensuring fair access and distribution of the benefits of digital technologies to all citizens.

**An inclusive digital city**

The ambition of an inclusive digital city is that it wants to make an everyday Amsterdammer digitally resilient and provide them with the right skills to participate. So the inclusive digital city ambition focuses towards using technology to provide information and education to skill up.

**A creative digital city**

A creative digital city ambition focuses towards getting solutions from Amsterdammers by creating public debates, discussion and
initiatives via the power of digitisation, art and culture.

2.5 Responsible innovation

In order to better understand how a responsible technology is arrived at, research was done on responsible innovation and responsible AI. Responsible innovation as defined by the European Commission in their Responsible Research and Innovation initiative:

A process where societal actors, researchers and innovators actively cooperate to co-define, co-design and co-construct solutions, services and products that are socially acceptable and sustainable and resolve important societal issues (European Commission, 2020)

In order to enable responsible innovation, there are many aspects that must be developed, learnt or adopted in our everyday practices. One facet is “risk”, there is a need for knowing ways of dealing with known and unknown (deep uncertainties) risks, we need ways of getting familiar and have tools of analysing risks of new technologies, know ways to reflect on new technologies from an ethical and risk point of view, be able to translate our moral collective values (eg: inclusiveness, safety, privacy etc) as technical requirements for new technologies. Technology, in general, inherits the values of its maker, how do we ensure that values presented during the development of the technology embody societal values. Lastly referring to responsible innovations definition, how do we ensure the technologies we develop have been co-defined, co-designed and co-constructed (Kormelink, 2019).

2.6 Responsible AI

Developments in technology are bringing many benefits to us and along with these benefits, there have also been a steady rise in risks that they are posing. One technology that is rightly being discussed about the most is artificial intelligence. In this section, the benefits that AI is bringing to society, risks of AI and a framework proposed by High level expert group on AI (AI HLEG, 2019) for mitigating these risks have been discussed.

Benefits of AI

AI as communicated by the European Commission is:

Systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. (AI HLEG, 2019)

AI is currently being used for good in many places. In the healthcare sector it is being used for disease diagnosis (Al-Shayea, Q. K. 2011), for robotic surgery (Kalis, B et al. 2018), image analysis (Kayser, K. et al. 2009), there have been tools created with AI for people with disability (Huawei. 2018), to educate and better understand the impact of climate change (Huntingford et al. 2019), for wildlife conservation (Gonzalez, L. F. et al. 2016) and for tackling world hunger (CIAT. 2018). There are many more applications of AI. Some of the risks that applications of AI have brought us are. Technology dependence (Jeff Robbins. 2016), we can reach a point where it could become harder for us to think for ourselves, the more and more we rely on our machines the higher are the chances that we will lose skills that we may one day come to regret. Similarly, in regards to Automation (O’Neill, M. 2017) big questions that rise is, can we continue to create jobs that only humans can do or will we need to consider a future without paid jobs. Algorithmic bias (Hajian, S. et al. 2016) this can be described as systematic and repeatable errors that create unfair outcomes. Because of this one group might be treated more favourably than the other. Our machines learn from our good and bad habits both and the way it is now they are only going to end up being very much biased and opinionated. Some of the other risks include Value misalignment (Estrada, D. 2018), Non-transparent decision making (Gunning, D. 2017), Heuristic manipulation (Andrew Maynard. 2019), lethal autonomous weapons (Krishnan, A. 2009).

To mitigate these risks there have been guidelines proposed in how we could go about designing, developing, deploying and using AI. High-Level expert group on Artificial intelligence proposes we should strive to work towards a trustworthy AI. As humans and communities, we will only be able to have confidence in the technology
and its application when there is a clear and comprehensive framework for achieving trustworthiness in place (AI HLEG. 2019). This entails striving for maximising the benefits of AI at the same time preventing and limiting its risks.

**Trustworthy AI**

An AI should be worthy of trust. This worthiness of trust should be there not just in technological aspects of AI that is development, deployment and use. But it should also be trustworthy in the socio-technical systems that its AI applications exist in. So this requires thinking about the concerns of AI systems as well as the different stakeholders involved in the socio-technical systems in a holistic and systematic manner. (AI HLEG. 2019)

There are three components of trustworthy AI:
- It should be Lawful meaning it should comply with all the laws and regulations
- It should be Ethical meaning it adheres to ethical principles and values
- It should be Robust from a technical and social perspective in order for it to not cause any harmful unintended consequences.

AI ethics guidelines (AI HLEG. 2019) presents a framework for how trustworthiness in an AI can be achieved. The framework constitutes three layers starting from the top at an abstract level to the bottom level being concrete. And this framework tries to achieve two things, how an AI can be made Ethical and how an AI can be made Robust. How an AI can be lawful is not part of this framework.

The framework describes four high-level ethical principles that are essential for a trustworthy AI and it describes the role of various stakeholders namely the developer, deployer and end-user who should ensure that seven key requirements are met by an AI system. These seven key requirements represent the essence of ethical principles. Next, the framework describes technical and non-technical ways of designing with these requirements and finally, the framework provides a way for assessing the AI system.

2.7 Amsterdam intelligence

Amsterdam intelligence is a report (Gemeente Amsterdam) published by the municipality of Amsterdam that describes how Amsterdam has been using AI and how it is considering its future use in Amsterdam. The document tries to answer the question of:

How to encourage positive developments, solve complex challenges and apply the necessary regulation to avoid any negative effects of AI?

The document was published after consultation with experts, researchers, private sector representatives and interested members of the public. It is described as a starting point for further discussion between the various stakeholders to refine the Action Plan for Artificial Intelligence in Amsterdam.

**Ethical use of AI in Amsterdam**

The set of principles and rules that the city of Amsterdam will be following for using AI in public spaces is a work in progress and the guidelines are expected to be released soon (Amsterdam intelligence). But certain aspects have already been mentioned in the coalition agreement (Government of the Netherlands. 2017) like non-tracking of people using wifi in public spaces and they have already released a data strategy document. For auditing and reviewing the guidelines, consulting firm KPMG has been employed.

The Amsterdam intelligence (Amsterdam intelligence) document though hints at the directions the city is keen to work towards. Aspects of awareness, organisational change, transparency, accountability and legitimacy have been discussed with respect to AI. And the ways of achieving them should be done with value-driven approaches that take into account the city of Amsterdam’s values.

Regarding generating awareness there are online and offline initiatives that are being worked on to create awareness about AI with the general public. One free educational initiative that is already running is AI-circus (AI-circus, 2020).
Figure 2.1. Trustworthy AI framework, Source. AI HLEG. 2019

**AI in the future**

AI applications being considered by the city authority include:

- Fraud detection
- AI to detect discrimination within algorithms or analyses
- Automation of Social Sector administration
- Poverty reduction
- Anti-terrorism preparedness
- Predictive maintenance of public areas and buildings
- Smart logistics and management plans for public areas and buildings
- Simulations of situations requiring public authorities to make choices (in areas such as mobility, traffic, energy and waste management)
- Administrative processing of bids and tenders
- Detection of faults and errors in construction projects
- Advanced traffic management

Figure 2.2. Future applications of AI in the city of being considered, Source. Amsterdam Intelligence
Regarding transparency, a lot of importance is being given to informing citizens about how the decision is being made and what type of data is being used and for what purpose. In close relation to transparency, accountability is also being stressed. The human dimension is discussed here and it is mentioned that the algorithm should never be given the power to have “the last word”. A human must always have the last say.

2.8 Conclusion

In this chapter we looked at Smart cities, Amsterdam as a digital city and some of the discussion that is happening around responsible technologies.
Key Takeaways

All the key takeaways from each section have been summarised below:

1. Governments around the world are finding Smart city initiatives very attractive and will continue to find them attractive because of the benefits it has shown to the stakeholders involved.

2. What these initiatives are lacking is a better understanding of the consequences it is having on its citizens. And there is a need for these initiatives to be aligned with their cities values while taking into account people from all walks of life.

3. From the digital city agenda, we get an idea of what kind of digital city the municipality is envisioning. In this digital city, the municipality will be formulating appropriate legislation that will protect its citizen’s freedom of speech and expression, it will be educating and skilling up its citizens to improve their digital resilience, it will provide its citizens with avenues to raise their concerns, share their solutions and they will be facilitating discussion around the ethical issues of digital technology. For citizens, this would mean being able to flourish in a digital city with some of the risks getting limited. A lot of attention has been put on developing a digital agenda for the city including adapting it to the ruling manifesto. But what the current agenda lacks is mentioning clear practices that would help them materialise their ambitions to reality. These could be tools, methods or frameworks that they deploy for shaping the digital city.

4. Technology is enabling things that we couldn’t even think were possible before but there are downsides to this, machines that can think and act faster than us are becoming more and more difficult to understand because of this we need to think strongly about what could go wrong in order to avoid disastrous things happening in the future. The framework proposed by AI-HLEG, could be used for working towards a trustworthy Ai.

5. Lastly, from the Amsterdam intelligence document we get to know that the city still needs concrete strategies and methods in regards to AI.
Chapter 3. Product Analysis

Content

3.1 Introduction
3.2 Method
3.3 Parking Control
3.4 Data Set & Optimisation
3.5 Result of Implementation
3.6 Conclusion
What will you read?

This chapter presents to you the research that was done on Scan Cars and it concludes by presenting to you the key takeaways from the research.
3.1 Introduction

In this chapter the Scan Car has been analysed to find answers to the following questions:
How do Scan Cars function?
How is the data collected by Scan Cars handled?
What has been the result of the implementation of Scan Cars?

3.2 Method

The answers of the following questions were found from the information that is already publicly available online and by conducting interviews. In total five interviews were conducted and the process of interviewing was done in three phases.

Preparation -> Interviewing -> Analysis

Preparation
Preparation involved creating an initial sheet of questions, reaching out to right interviewees and creating an interview guide and consent form for participants.

Initial questions --> Contacting interviewees --> Interview guide + consent form

The initial sheet of questions can be found in the Appendix 1.

Interviewing
Participants were interviewed in a semi-structured interview format. During the interviews, participants were made to engage in activities that let them visualise certain information that they were providing. Video conferencing software Zoom in tandem with digital collaboration website Mural was used for tools for facilitating the interviews.

Semi-structured interviews + visual activities

Figure 3.1: Outcome of an interactive activity done with an interviewee on Mural, interviewee here explains the interaction between different stakeholders. Source: Interview 1: Programme manager, AMS Institute
Personnel who were interviewed:

1. Programme Manager, AMS Institute
2. Business Development Manager, Arvoo
3. Data Analyst, Gemeente Amsterdam
4. Advisor of digital innovation, Gemeente Rotterdam
5. Member, TADA Bureau

Analysis
The interviews were next transcribed and analysed for new information. Information regarding Scan Cars that is publicly available in documents and media were also analysed. Each document and website has been referenced in the sections below. Interview transcripts and activities can be found in the Appendix 1.

Transcribing -> Analysing transcripts + Websites

3.3 Parking control

Municipalities play a big role in how our cities are run and how its future is shaped. One of the roles the municipality has is to ensure that there is an efficient use of space in the city and especially in big cities where the need is seen easily. One of the ways in which the municipality is ensuring efficient use of space is by enforcing parking control.

Over the years municipalities have done this by deploying parking assistants to ensure people pay for their parking ticket and park their cars in the right manner. This system even though makes a lot of people pay for their parking ticket it still is not a perfect system as it has not been able to ensure that everyone pays. There are multiple reasons for it, with one being that it is a labour-intensive process that requires a lot of resources. This led to the municipalities to find better ways of parking enforcement.

With the growing trend of digital technologies and IoT devices, it led them to look at technological solutions for the answer. Their answer was the introduction of a technology called Scan Car. Scan Cars are cars with a certain sensing technology installed on the roof of the car. They have multiple use cases but are predominantly being used by the municipalities for parking enforcement and here the working of Scan Car used for parking enforcement has been described.

Scan Car background
Scan Cars are being used for parking control or parkeer controle (in dutch). It drives around the city scanning license plates of cars. When a car is found to have not paid for its parking, a signal is sent to a parking inspector who goes on his scooter to give the fine. The time from getting the signal to giving out the fine is known as handling time. But there are exceptions in few cities like Amsterdam who do not find it necessary anymore to send a signal to the parking inspector they instead send the fine directly to the car owner. They have found that many times during the handling time period, many citizens get away without paying their ticket (Parkd, 2018). In this thesis, the focus has been kept on cities that use Scan Cars like they do in Amsterdam.

Scan cars are currently being used in Eleven cities in the Netherlands (NOS, 2019). The Scan Cars that run in these cities have been developed by a company called Arvoo Imaging Products B.V. and it is being run for the municipality by Egis Parking services. Egis parking services won the tender for running the Scan Cars on January 1st 2016 and has been running the Scan Car on behalf of the Municipality since then. (Interviewee 1: Programme manager, AMS Institute, March 11, 2020)

Scan Car working
This section talks about the working of Scan Car, the information presented here are educated guesses inferred from interviewing an employee of the technologies developer Arvoo imaging products B.V and by referring to the public information present on the Gemeente Amsterdams website.

Scan Cars have 12 cameras in its scanning unit which consists of Automatic number plate recognition (ANPR) which uses the image recognition technology, a panoramic camera which takes 4 pictures of the parking scene and a global navigation satellite system (GNSS) which records the location and time (Interviewee 2: Business development manager, Arvoo, March 19, 2020). After a Scan Car scans a car
all the information from cameras are converted into a digital file. There are multiple scenarios that can occur after this and few of them have been discussed below.

**Regular fine scenario**

![Figure 3.2: Regular fine Scenario, Source: Author](image)

In the regular fine scenario, the digital file from the cameras is first cross-checked with the Netherlands Vehicle Authority (RDW) database to check if the number plate is a valid plate and in the case of Amsterdam also if it is a stolen vehicle. (Interviewee 1: Programme manager, AMS Institute, March 11, 2020)

If it is a valid plate then next it is cross-checked with the Nationaal Parkeer Register (NPR) to check if there is any form of violation i.e car owner has not paid for the parking ticket or if the car has not been parked right. If it is not a valid plate or if it is a stolen vehicle then please refer to the Not valid plate/stolen vehicle scenario to know the possible chain of action that follows.

If there is no violation then the captured data gets deleted. In case there is a violation then the data is cross-referenced again with the Nationaal Parkeer Register (NPR) database to check if the vehicle has a valid permit. If the vehicle has a permit then the data gets deleted or else time limit of 5 min begins if within the timeframe the car owner pays for a parking fine is not processed further if it has not then the data is next sent to a special investigative officer (Bijzonder opsporingsambtenaren (BOAS)) (Gemeente Amsterdam, 2015). Up until this point, everything has been done by the Scan Cars algorithm and only at this point a human gets involved.

Before the Special Investigative officer sees the image of the number plate and the parking scenario the digital file goes through a blurring server so that faces of any person around the car gets blurred out. The role of Special investigative officer is to check visually if the predicted number plate has any error or if there is an exception to the car by looking at the parking scenario (Interviewee 2: Business development manager, Arvoo, March 19, 2020). Please refer to exceptions to know what cases have been defined as an exception.

If the special investigative officer at any point is unsure to give out a fine then he either lets a fellow special investigative officer have another look at it or he sends out a signal to a parking assistant to go out on his bike to check it manually. If there still remains a sense of doubt then the fine is not issued. But if there is a clear case of violation the fine is sent to the car owner via mail (Interviewee 2: Business development manager, Arvoo, March 19, 2020).
Figure 3.3. What the Scan Car sees and what the Boas sees, Source. Author

Not valid plate/ stolen vehicle scenario

Figure 3.4. Not valid plate/ Stolen vehicle scenario. Source. Author
If the car does not have a valid plate then the algorithm immediately checks if it is a foreign vehicle and if it is then the same check for violation is done and if the vehicle is found to have violated any rules then a parking assistant is sent out to leave a fine on the vehicle’s windshield.

In the case, it is either an invalid license plate or a stolen vehicle a message is sent directly to the special investigative officer who cross-checks it and if it is indeed either an invalid plate or a stolen vehicle he forwards the digital file to the responsible authority for further action.

Some facts about Scan Cars
The cameras have an accuracy of 1 cm and are able to scan 1200 cars per hour. The cameras have a resolution of approximately 2.3 megapixels. Some of the reasons for having a low-resolution camera are one having low resolution helps keep the overall unit to be small and the second reason being the system has to comply with certain privacy laws (Interviewee 2: Business development manager, Arvoo, March 19, 2020). About 12 Cars are being used in the city of Amsterdam. Egis Parking Services B.V., Nieuwpoortstraat, Amsterdam is the location where the Scan Cars are parked (Interviewee 1: Programme manager, AMS Institute, March 11, 2020).

Exceptions
There are a few scenarios where exceptions are made to not be fined (Gemeente Amsterdam. 2015). It is unclear if more scenarios exist.
- if they see you are standing still to let the passengers hop on or hop off quickly
- Are loading or unloading something from your vehicle
- Have the hood of your car open

Fine
The municipality follows an escalation model of fining someone. A maximum of one parking ticket with € 64.50 costs is imposed per day. Except if the same car is scanned in multiple places on the same day. Then a parking ticket plus fixed cost amount of € 64.50 is imposed per location (Gemeente Amsterdam. 2015)

If a parking control scan car has made several scans of the same car in the same place, the detected parking time (parking duration) will be applied. The costs of the parking ticket are calculated as follows:

- If one scan has been made: parking ticket (additional assessment for parking taxes) consists of a fixed cost of € 64.50 + 1 standard hour of parking at the applicable parking rate.

- If multiple scans have been made in the same place within one hour: parking ticket = fixed cost of € 64.50 + 1 standard hour of parking.

If several scans have been made in the same place: parking ticket = fixed cost amount of € 64.50 + established parking time multiplied by the applicable parking rate. Depending on the length of the observed parking time and the time, this can also be the rate of, for example, a day or evening ticket. The established parking time is determined between the first and second/last scan.

- You can be fined two ways if you don’t pay for your parking space. If you are in a place where you can stand, but do not pay, you will receive a so-called additional tax, because parking fees are officially a city tax. This is done by the municipalities, the rates differ per municipality. If you are in a place where you are not allowed to stand, this is called error parking and those fines are collected by the CJIB, just like other traffic fines

Object
A citizen can object his decision by requesting an objection to the municipality and the municipality then forwards the request to Egis parking service. Egis then handles this objection in Amsterdam's mandate and sends a decision to the person who submitted the objection (Interviewee 2: Business development manager, Arvoo, March 19, 2020). Objection to the parking ticket can be made in two ways:

Online:
An online objection can be made up to 6 weeks from the date of getting the fine. After that, only a written objection can be made.

Written objection:
In a written objection, one can object to several parking tickets in one letter. It is suggested to object within 2 weeks from the date of receiving
the parking ticket as after 2 weeks a reminder is sent to pay and the fine is increased by 7 euros. If the objection is made after 6 weeks, there will be no appeal against the decision of the objection. In general cases after the appeal, it takes 8 weeks for the decision to be made about the objection but sometimes it takes longer.

When an objection is officially filed the recipient does not have to pay his/her fine but if the objection fails then receipt has to be paid within 10 days and if paid later a 7 euro increment is made.

Viewing photo
If one objects via the website, they can see on request the photo that the scan car made of the license plate. They can also request a situation photo. Sometimes no picture is taken. This is then stated in the letter accompanying the decision on the objection.

Cost
This procedure costs private individuals € 47 (2018 rate). For companies (legal entities) € 345. You usually get these costs back if the appeal is declared well-founded.

3.4 Data set and route optimization

Route of a Scan Car is optimized to obtain maximum revenue for the municipality. And this route is determined by the past data that they have about the areas where most of the parking offences happen. The data sets for training the algorithms are obtained from outside the country (Interviewee 2: Business development manager, Arvoo, March 19, 2020). An annual audit of algorithms is conducted but it is unclear who conducts these audits. The best guess here would be the consulting firm KPMG as they have been hired by the municipality to review their guidelines on algorithms for them, as mentioned in the Amsterdam intelligence document (Gemeente Amsterdam).

Data
All the data that is collected belongs to the municipality (Gemeente Amsterdam. 2016). The municipality collects visual information of car license plates, location, time and surroundings of the car which may have faces of people and which are later blurred out. After the fine has been sent all of this data is held by the municipality for either only 48 hours if the fine has been paid by then or it is kept by the municipality for 13 weeks. A citizen can contest the decision within 6 weeks and the additional weeks for which the data is held is for the court to make its decision.

For the period in which data is held by the municipality, it reuses the anonymised version of the data for other purposes. The only known current purpose it is using it for is knowing parking pressure in certain streets (Interviewee 3: Data Analyst, Gemeente Amsterdam, March 27, 2020). The complete data handling process is governed by ISO 27001 certification which is an information security standard given to organisations after an external audit. In the case of Scan Car, it describes how data should be stored, handled and viewed by all the stakeholders involved. This measure is taken against the privacy concerns of citizens. The municipality has also made privacy agreements with Egis parking services the company that runs the Scan Cars on the municipalities behave, detailed privacy agreements that defines both their roles can be found on the Gemeente website. (Gemeente Amsterdam. 2016)

3.5 Result of implementing Scan Car

For the municipalities Implementation of Scan Cars meant they could now conduct twice the amount of checks in the city, which also resulted in a substantial increase in the amount of money being collected from parking fines. Naturally, there was a reduction in manpower being deployed and less aggression being shown towards parking inspectors. Though no publicly available data was found which spoke about the increase in the tendency of citizens to pay their parking tickets because of this. The effect Scan Cars had on citizens will be explained in the user research section.

3.6 Conclusion

In this chapter, it was learnt about why Scan Cars are being used and educated guesses were made as to how they function, what is happening to the data after it is collected, how it is processed and reused and lastly the result of the implementation of Scan Car was looked at.
Key Takeaways

1. From the section that describes how Scan car works, it was learnt that the final decision if someone is fined or not is always done by authorised personnel and citizens are not subject to an automated decision and that this will remain for some time to come in the future.

2. An observation was made that there is no publicly available page with complete aggregated information that talks about how Scan Cars work, what it is seeing, what data it’s collecting and what is happening to a citizens data. Auditing of algorithms of Scan Car is done by a third-party organisation. So far it is unknown who conducts these audits and what criteria are chosen for auditing the algorithms.

3. Citizens are given channels through which they can object their parking fines but no channels were found where citizens are given medians to object the way Scan Cars are being run in the city.
Chapter 4. Municipality

Content

4.1 Introduction
4.2 Method
4.3 Approving Projects
4.4 Citizen involvement
4.5 Ethical Discussion
4.6 Conclusion
What will you read?

This Chapter presents to you the research that was done on the Municipalities and it concludes by presenting you the keytaways from the research.
4.1 Introduction

Municipalities were researched to find answers to the following questions:
- How do they approve digital projects?
- How do they involve citizens in their projects?
- How are ethical discussions initiated within the municipality?

4.2 Method

To find answers relating to the Municipalities the exact same method from the product analysis chapter was used here. Preparation involved the creation of an initial set of questions, contacting interviewees, creating an interview guide and consent form. Interviewing constituting semi-structured interviews and visual activities and finally analysis including transcribing and closely going over the transcripts and relevant websites. The same steps that were followed in the previous section.

Preparation --> Interviewing --> Analysis

4.3 Approving Projects

Municipalities consider two aspects to be important when approving a project. One is it solving an existing problem or a new problem in a better manner and second the return on investments for deciding which project to approve. If a project meets any of these two conditions then a pilot test is done to validate it. Generally, each department is responsible to address their own needs but projects that concern the usage of digital technology has to go through the Chief technology office (CTO) for it to be approved (Interviewee 4: Advisor for digital innovation, Municipality of Rotterdam, March 27, 2020).

There are many ways in which new technology gets introduced within the municipality. Sometimes certain departments need to execute a task and they come across an existing or new technology that can be used to execute the task better. Sometimes companies approach municipalities with technologies that can get things done in an improved manner and there is also an ICT department within the municipality that informs each department about different technologies. There are also cases where citizens approach municipalities to address their certain needs and certain digital technology can address that need better (Interviewee 4: Advisor for digital innovation, Municipality of Rotterdam, March 27, 2020).

In some projects when the cost of continuously running the project alone is high then the municipality can layout an open tender in which organisations can bid to run the project on behalf of the municipality. When the tender is won by a company to provide the municipality with a certain technology or a service. In that tender certain KPIs are also listed which the municipality will use to assess the returns and the partnership with the right tendered company. In some cases, politicians also have a say in which projects the municipalities can take up (Interviewee 4: Advisor for digital innovation, Municipality of Rotterdam, March 27, 2020).

4.4 Citizen involvement

Municipalities try to involve citizens in many ways. For example, if a project is being introduced they organize an assembly with the residents and also different neighbourhoods have a political representative, civil servants who ensure citizens involvement. There are some apps, online tools already in place for citizens to interact with municipalities. Some of which are also being developed at the moment. (Interviewee 4: Advisor for digital innovation, Municipality of Rotterdam, March 27, 2020).

In the decision-making process in certain projects “questionnaires” are used to consult with residents if they agree with a certain project. For example projects like “renewing the streets”.

A participation ladder system is also used by the municipality to see when and how can citizens be involved with projects and what degree of power will a citizen possess in decision making. Arnstein’s ladder shown in image would later play a role in the final concept that was developed.
Due to recent data scandals that have happened in certain parts of the world, there has been a lot of discussion about privacy and this led to General Data Protection Regulation (GDPR) or Algemene Verordening Gegevensbescherming (AVG) in Dutch being implemented in the whole of Europe. This meant every organisation including the municipality must have a Data protection officer or Chief privacy officer in their ranks who monitors how data is collected, processed and used. So far privacy has been a focal point of discussion within municipalities. In order to encourage discussion with respect to other ethical values in everyday practices, there are tools that are being developed for example Data ethics decision aid (DEDA) is one such tool that facilitates the ethical discussion regarding data handling (Utrecht data school, 2020). Another initiative that is being worked on is the TADA manifesto (Amsterdam Economic Board, 2019) which describes six values on responsible data usage and has developed practices that can help to incorporate those values.

4.6 Conclusion

In this chapter, we looked at three aspects: one how does the municipality approve digital projects, how do they involve citizens and how does currently ethical discussion happen within the municipality.
Key Takeaways

1. Approval of an innovative project within the municipality is not a straightforward process there are many different departments that will have to be consulted and coordinated with depending on the project. But the primary criteria looks to be if it is solving a problem better and return on investment of the project.

2. There are mediums through which citizens can be involved in projects but depending on the nature of the project only then it gets decided the level of involvement needed by citizens.

3. There is still very little known about the amount of discussion that happens in the municipalities regarding the ethical implication of a project but there are enough indications to suggest that methods that help open up discussion will be encouraged.
Chapter 5. User Research

Content

5.1 Introduction
5.2 Method
5.3 Themes
5.4 Conclusion
What will you read?

This Chapter talks to you about how citizens perceptions was researched and discusses the five themes that emerged from the research.
5.1 Introduction

User research was done to find out two things one to find out what role are the technologies in public spaces playing in peoples lives and second, focussing specifically on Scan Car to find out how much do people know about Scan Cars.

In both scenarios, people's views, likes, dislikes and concerns were explored. Six virtual generative workshops were conducted to elicit people’s views. The end goal of the workshops was to enable a better understanding of citizens perspectives.

5.2 Method

The process that was followed has been shown below. The convivial toolbox book (Sanders et al. 2012) was referred for the process and the creative facilitation book (Katrina et al. 2019)) was referred for planning and for conducting myself as a facilitator.

Mind map - Preparation - Pilot test - Workshop - Documenting- Analysis - Insights

**Mind map**

A mind map was made to put out all the thoughts, assumptions and views about the topic and also to make a guess about what things a citizen might like, dislike and have concerns about the topic. These assumptions were later visited again after the workshops were complete.

![Figure 5.1. Mind map of expected views of citizens, Source. Author](image-url)
Preparation
The preparation for the workshop included activities like creating a screener, promotion plan consent form, sensitizing booklet, and a workshop plan.

Screener
For recruiting opportunistic sampling was used with the majority of participants being students but attempts were made to reach out to ideal participants. Ideal participants that were needed for these workshops were Dutch citizens living in a city that was affected by Scan Car in some way. Due to the lack of clear channels to reach such people and not having the ability to speak Dutch, the workshops were made in such a way that would accommodate two types of participants: one Dutch citizen living in a city and two Dutch citizens living in a city and were affected by Scan Car. The Screener can be found in Appendix 2.

Promotion plan
Promotion of the workshop to find participants was done on various platforms. Platforms like Facebook, WhatsApp and smart city-related websites were used for finding participants. The promotion was also done using the support of AMS institute staff.

Workshop plan
The workshop was initially planned to be conducted for 75 min but after the pilot test, the workshop was adjusted for a period of 90 min. The detailed workshop plan for the pilot and the final plan can be found in Appendix 2.

<table>
<thead>
<tr>
<th>Session time</th>
<th>What</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 min</td>
<td>Introduction &amp; Icebreaker</td>
</tr>
<tr>
<td>5 min</td>
<td>Instructions</td>
</tr>
<tr>
<td>15 min</td>
<td>Collage making</td>
</tr>
<tr>
<td>10 min</td>
<td>Ask them to share their first collage</td>
</tr>
<tr>
<td>10 min</td>
<td>Collage making</td>
</tr>
<tr>
<td>10 min</td>
<td>Share second collage</td>
</tr>
<tr>
<td>5 min</td>
<td>Reflecting</td>
</tr>
<tr>
<td>5 min</td>
<td>Feedback/ Wrap up</td>
</tr>
<tr>
<td>15 min</td>
<td>Leeway/ buffer time</td>
</tr>
</tbody>
</table>

Figure 5.2. Workshop plan, Source. Author.png
Pilot test
A pilot test was conducted with three participants who were part of a 75 min workshop. The pilot test helped improve many aspects of the workshop. The workshop was switched from 3 people to 2 people excluding the facilitator and the workshop time was pushed from 75 min to 90 min to have a smoother experience and the pilot helped to improve the tone of voice to be used and the type of instructions to be given to the participants.

Workshop
For participants, the workshop involved filling the sensitizing booklet and sitting in a generative session, which consisted of two collage making activities. In total 6 workshops were conducted with 5 workshops being conducted with 2 participants each for 90 min with an exception of one workshop being conducted with 3 participants for 105 min.

Figure 5.3. Complete canvas and collages of a participant, Source: Generative sessions

Figure 5.4: Collages of one of the participants, Source: Generative sessions, Appendix 2
Analysis
The data from the workshops was analysed to find common patterns which lead to insights. This was done by first converting recordings from the workshops into transcripts and then using in-vivo coding categories were formed which were lastly clubbed into themes which represent the insights. The transcripts of the workshop can be found in Appendix 2.

Workshop -> Transcribing -> In-vivo coding -> Categories -> Themes

5.3 Themes

Collage 1:
The workshop involved two collage-making exercises the first exercise was focused around the topic of their city. Participants were encouraged to describe the relationship they had with their city, what activities did they like performing, what did they dislike, how did they interact with their surroundings and their neighbourhood along with this participants were sensitized to think about their city as a digital city as well. Participants were given a specific set of words, images and symbols to describe their experience. Throughout the process, participants had the freedom to talk about what they wanted to talk about and it was very much focused on their experiences. After the participant finished making their collage and describing their collage to everyone, follow up questions were asked and discussion was encouraged between the participants. Three themes emerged from the first collage making exercise.

Theme 1: Their city
Theme Their city describes how the participants feel about their city, what things they like, dislike and what makes them feel safe in their city.

Categories:
Feelings
Likes
Dislikes
Safety

Participants described themselves as feeling safe in their neighbourhoods but at the same time very individualistic when they are out in the public space, they also described how their technological dependence is increasing and this has led them to have less and less interaction with the strangers in their cities. Participants also feel that they are getting tracked by their devices but many participants expressed that they trust their government.

“Uh, so this is Alexa, or maybe they scan my face in Schiphol and they make all kinds of calculations about it. But, um, that's kind of like, I may be concerned or I'm afraid of, uh, big corporates and not, not necessarily about the government or. They're just scanning cars.”

“Yeah. I feel pretty safe, but you could do more with it. So if I know, Oh, it's the municipality, then I could think like, Oh, they could scan, well, the municipality probably doesn't care about where I go shopping or that kind of stuff.”

“I think it's about the government and at the moment I trust the government a lot, but you never know, you never know what's gonna happen then”

Participants shared some of the activities they like doing in a public space. Things like jogging, cycling and partying were predominantly their favourite activities. They like it when a stranger goes out of their way to help you. Participants also described a few instances where they liked how technology is being used in their city.

“Rotterdam now that give priority to bicycles when it rains. So they don't have to wait in the rain. Um, and I think that's a very positive point”

“I really like it because I know how long going to have to wait.”

Participants disliked the fact that in order to participate in the city you have to be a techie and they feel that they are being tracked by the devices and they have no idea what these devices are capable of.

“So that's maybe, um, yeah, its also odd also because I, I don't really know what these cameras and all these digital stuff are capable off, I think. Um, and yeah, I feel like I'm being watched when I have my curtains open in the evening with these drones or cameras or apps or whatever.”
During the workshop, there was a discussion on what would make them feel safe in their city. Will having more police presence make them feel safer, will having more cameras or none of the above. Each participant had their own views with no single answer standing out from the rest.

“[00:35:15] Um, I found out it, I’m actually, um, more concerned about seeing police on the streets than just cameras. Um, and I think it’s maybe because. Uh, police officers can give you like direct feedback. So when I see a policemen around, I think, okay, I have to do cycle really. Um, Yeah with no mistakes now and don’t use my phone and stuff like that.[00:35:39] But when I see cameras, I don’t have the feelings."

“it depends on the neighborhoods. Like, for example, if it’s really crowded and. Yeah, there’s happening a lot of stuff there. Maybe I see there are shootings or I don’t know, violent crimes. And I think it’s the regenerative cameras. They’re not for me or the people. So I feel kind of more safe for them. I think just more safe in general, but for me, um, the, if there were a lot of grandmas places, then I heard like a benefit, like a shopping center.”

“[00:37:15] So there’s a lot of police on the street and I think they sort of tried to give you safety”

“but when you are going to the train station there, especially you see these cameras it’s full of them. So you’re being noticed.[00:39:12] I don’t know if I like that or not. So it has two sides, of course. Um, and on the one hand, I, I feel a bit, maybe a bit safer because you know that if somebody’s gonna rob you whatsoever, they are being recorded on the other hand. Yeah. I don’t know. Especially with, with the algorithms nowadays. I don’t know what they knew about me and that concerns me a bit.”

Theme 2: Future Cities
Theme Future cities describes what expectations the participants have about their city and how they think the future of their city is going to feel like.

Categories:
Expectations
Feeling in the future city

Participants think the future of their cities is going to be devices which are connected to each other and this would enable many new services which is seen in a positive light. They also think the theme of sustainability will take centre stage with citizens knowing how they could contribute to this city. With some participants expressing their desire to live in a car-free city.

“I would love to see a future as a smart city where all the cars are gone”

Though in this future city participants think they are going to be heavily surveilled and tracked. Some of the participants have even described living in a draconian city with them preferring to live in villages which they think will be less surveilled than live in a city.

“draconian invasive way of policing and managing cities, which is a very draconian way of getting involved in your day in life”

“I’m actually going to move out to the countryside where okay, maybe I have internet, but there are no CCTV cameras”

Theme 3: Developing tech
Theme Developing tech describes some of the concerns participants have about the technologies that are inhabiting our cities and they talk about how they would like these technologies to be developed.

Categories:
Concerns
How to

Participants expressed that they are not sure if the technologies that are being deployed in their cities are well thought. And they fear as more and more services become automated we are going to lose the human element from them. They are unaware as to what technologies are out there in their cities, what is it collecting about them and what consequences these technologies will have on them.

“but for example, if they have so many pictures of me, maybe my, my future employer employee in. 10 years they have all kind of info about me and is able to request all kinds of things that I did when I lived there. For example, yeah, it was, I don’t know what will happen with it in the future, but
certainly not now for example, but what can, what they can do here.”

“So that’s like, one of the things is [00:34:00] having Google maps does not make you speak to strangers.”

“when an old police officer walked around the neighborhood, everybody knew his name. He knew everyone else’s name”

Participants also expressed how they would like these technologies to be developed.

“What do we want to protect? What values and principles do we want to protect as city? Uh, so that we have a nice, um, uh, inclusive and resilient and responsible city, a fair and ethical city”

“who is the, who controls it, who is defining what is acceptable to, uh, the community and what is not acceptable to the community.”

Collage 2:
The second collage making exercise was centred around Scan Cars where participants were encouraged to share their thoughts about Scan Cars. Just like the first exercise participants had the freedom to talk about what they wanted and share their thoughts, opinions, concerns, likes and dislikes and after they shared their collage follow up questions were asked and discussion was encouraged between the participants.

**Theme 4: Users perception of Scan Car**
Theme Users perception of Scan Car talks about the first impression participants had when they got to know about the Scan Car and they talk about how the Scan Car makes them feel.

Categories:
First impression
Makes them feel

Many participants initially mistook Scan Car for the Google streetcars but eventually, everyone was able to realise that it wasn’t the Google streetcar. Some have described the Scan Car as a robot on top of a car and even terming it as a bad guy.

“And then one day I came back from school and I saw it and I was waving to it and I was on street view like this and my face was, and I was really happy about that.”

“It’s seen as a spy, as a bad guy as, um, um, not something that’s being used for the greater good. I think therefore [00:57:00] what’s needed is people need to know exactly what the system is doing. Um, how their data, um, or how the images are being used.”

A few participants felt fine with how they are being used in public spaces with some expressing anxiety regarding their parking experience.

“so I think at the moment, I think, I think the way they utilize now is probably fine.”

“[00:34:22] Um, so at first, when I have to like unload all my stuff and, and moving, um, I was constantly like listening and staring out of the window if the scan cars were around. Because of course I didn’t want to, to get a fine, um, because off the roads I thought, okay. Maybe it’s a better idea for my stress balance to just, uh, um, get a sort of, um, Uh, yeah, a ticket.”

“I was walking back from, uh, streets to my house when I saw the car driving through in our streets. And we just, we had just had moment from fuck. [01:09:54] Did we, did we, uh, did we, um, [01:10:00] update at the time that we could park. And we were like, no, and we tried to, to, to, to immediately fix it, but we couldn’t. And at the end I had to pay 90 euros for fine”

**Theme 5: Things that can change**
Theme Things that can change talks about the changes the participants would like to see in Scan Car, this involves the improvements it can have and the things they would like to know more about it.

Categories:
Improved Scan Car
Want to know
Why know

Participants would like to have a secondary function to the Scan Car which benefits the neighbourhood in some way. The participants have also expressed a need to know many things. Participants want to know how the Scan
Cars function, what data is it collecting, what is happening to the data after it is collected, who has access to this data and a few similar questions like these. Upon being asked as to why would they want to know such information, participants have expressed a need for understanding.

“And, um, yeah. Well, when you see a scan card for people, it’s not clear what, what it might do.” “As a citizen, I’m a bit worried about how, how these kind of services work.”

“we don’t know what it, what it does exactly. And what it’s, uh, what is going to, to, to be, [00:51:00] and what it can be used for in the future.”

“It’s not, it’s not that I feel unsafe, more understanding just in general”

5.4 Conclusion

In this chapter, the complete process and the results of the workshop with citizens were described.
Key Takeaways

1. Citizens feel they are being tracked and monitored by the devices in the city and they expect this to increase as time goes by.
2. Citizens trust in decisions taken by their government.
3. Citizens like it when devices in their cities adapt to circumstances to their benefit.
4. Citizens are unsure of the capabilities of devices that process the collected data with algorithms.
5. Many citizens expressed a need for a societal function to Scan Car.
6. Citizens expressed many aspects that they would like to be shared with them. Things like what data is being collected about them, what is happening to their data, what is it being used for and how etc.
Chapter 6. Design Directions

Content

6.1 Introduction
6.2 Design Directions
6.3 Conclusion
This Chapter talks about the three Design Directions that emerged from the Analysis phase.
6.1 Introduction

This chapter presents design directions which constitute the different insights from the Analysis phase.

6.2 Design directions

Design directions are about the things that were learnt from the research phase these include insights from observations, interviews, sessions and literature. Each design direction is trying to describe a change that is needed within the different sociotechnical systems that we live in.

That's how it’s done

From the literature on smart cities, responsible innovation and responsible Ai/trustworthy Ai it was learnt that in order for our tech to be responsible there is a need for having better ways of doing things. We need newer methodologies, processes and practices that help in looking at the problem from various perspectives.

There are many aspects these practices should include:

- Ways for organisations to know the consequences of their technologies before the development, during and after the deployment. Teaching how to take into account the different values of the society and of the citizens from all walks of life.
- Ensuring the involvement of different actors of the society, NGOs, citizens, public organisations and making clear when they are to be involved and how much power they are to possess.
- Teaching ways of assessing and dealing with the known and unknown risks.
- Making clear who the responsible stakeholder is when any mishap happens.
- Teaching to make the right tradeoffs with regards to the decisions made with respect to the technology.
- Ensuring the presence of the human dimension with respect to automated decision systems. Encourage discussion regarding the ethical use of technology.

Each aspect described here either could be seen as a requirement for the design or could be a standalone problem statement. Possible outcomes of choosing this design direction could be a tool, methodology or a set of practices that would embody one or multiple changes described here.

Citizens and the city

The generative sessions gave us some impressions about how citizens feel in their cities, things they desire and the things they expect from it. Theme 2: Future cities from the user research speaks about this explicitly. Citizens expect their future cities to be themed around sustainability and about connected devices that provide different kinds of benefits and services. And they expect this connectivity to be smart and work towards a positive benefit.

A good example of this was given by one of the participants. Traffic signals in Rotterdam now give priority to bicyclists when it rains and this smartness of the devices adjusting to circumstances is seen in a positive light.

"Rotterdam now they give priority to bicycles when it rains. So they don’t have to wait in the rain. Um, and I think that’s a very positive point”

Many participants expressed that they trust their government and they expect they will make well thought decisions when it comes to their city and them. And this trust in the government is definitely a good sign but ensuring this trust is maintained and built upon is paramount. Feeling surveilled and monitored by various devices was spoken of many times. They also expressed the various information needs that they have, these needs have been specified in the Theme 5: Things that can change. Even though participants struggled to clearly articulate why they would like these needs to be addressed and in which circumstances knowing this information will be beneficial to them. There was a constant mention of a need for understanding and an acknowledgement that data-collecting devices in public spaces are affecting their lives behind the scenes and when it does directly they would like to know how did that come to be.

Things that need to be changed are:
- Trust between the authorities and citizens needs to be fostered further.
- The information needs of citizens need to be
addressed.
- Citizens must be given a certain amount of power to shape the development of a technology that can affect them.
- Lastly a question. Do we want our citizens to feel that they are constantly being surveilled and monitored in their cities? Or is this one of the unavoidable consequences of using data-collecting devices in cities?

If this design direction is chosen then the final design deliverable would embody some or all of the aspects presented here.

The Role
This design direction “The Role” basically questions the role Scan Cars should be playing in society. When we compare the Scan Cars to the six values for the responsible data usage in the city that the tada manifesto promotes (Amsterdam Economic Board, 2019), and even to the ambitions of the digital city that the digital city agenda promotes (Gemeente Amsterdam, 2019) we find a few aspects that the Scan Cars and the various data-collecting devices in the city can improve upon.

When we look at each Tada values and compare it to what has been learnt about Scan Cars so far we see:

![Figure 6.1. Six values of responsible data usage (TADA), Source. Amsterdam Economic Board, 2019.png](image)

Inclusive
With regards to the value of inclusive as to how it is defined here we see that the way the Scan Cars are being run, no individuals or any specific group are in a position to be treated unequally or discriminated against as the Scan Cars do not recognise any particular faces but only license plates for giving out fines.

Control
With regards to the value of control, Scan Cars do not seem to hinder or contribute towards the freedom of citizens, they are being used by the authorities to better enforce parking within cities which on the whole is to serve the citizens but citizens here don’t have any control over what is collected about them and what is being done to their data.

Tailored to the people
The value of tailored to the people has been implemented well as the final decision of if someone gets fined or not has been assigned to a human and the data that the municipality holds is only the license plate information which gets deleted eventually after a maximum period of 13 weeks.

Open and transparent
This value was spoken about a lot during the sessions with citizens. Everyday citizens are not
aware of what data Scan Cars are collecting, how it is being collected and what have been the outcomes of this collection and usage of data. Though the purpose of Scan Cars has been clear.

**Legitimate and monitored**

At the moment citizens have no control over how Scan Cars are being run and at the moment there are no clear easy ways to influence how they should be run and at the moment there is no clear indication if the social consequences of Scan Cars are being monitored by any officially recognised organisations.

From everyone and for everyone

License plate data that is held by the municipality is rightly deleted after it has served its purpose but the data that is reused to know in general as to where the parking pressure of more in the city is publicly available for any citizen to access online (Gemeente Amsterdam, 2020).

When we compare the role the Scan Car plays to the Amsterdams digital city ambitions of being free, inclusive and a creative city (Gemeente Amsterdam, 2019). We see that a Scan Car does not contribute significantly to any of the three ambitions.

**A free digital city**

A Scan Car neither impedes nor cherishes the freedom of speech or expression of any Amsterdammers in the city.

**A inclusive digital city**

The current usage of Scan Car does not discriminate against anyone but it does not help and support an everyday Amsterdammer either.

**A creative digital city**

A Scan Car does not contribute in any way to any creative initiatives or help raise awareness about any social issue or ethical issue concerning any technology.

Digital city ambitions are forward-looking ambitions and Scan Cars though in its current form does not contribute significantly to any of the ambitions; these ambitions can be a good starting point for its future applications.

The aspects that can be improved about Scan Cars are:
- Scan Cars need to be open and transparent about what data is it collecting, for what purpose.
- Giving control to the citizens regarding the way Scan Cars are used.
- Scan Cars contributing to a free, inclusive, creative digital city.
- Is Scan Cars the right means to achieve the goals that it is meant to achieve?
- Just like before if this design direction is chosen then the design would grind to embody the presented points.

### 6.3 Conclusion

In this chapter three design directions that could be pursued were described. The next chapter will describe how the design direction was chosen.
Part 2
Explore - Change Statement
About Explore

This phase of the project can best be described by the co-evolution of the problem-solution model proposed by Kees Dorst. Which talks about an observed phenomenon, it states that the link between the interesting information of the research and the problem becomes clear with an idea (creative insight).

In order to get a better understanding of the problem to solve the design directions from the previous section were explored using ideation techniques. Some ideas were chosen and discussed with certain stakeholders using storyboards and the feedback from stakeholders was used to choose a concept that was used to reformulate the initial problem statement to a change statement.

About Change statement

For the design phase (Diamond 3) an effect driven design approach from the social implication design (Tromp & Hekkert, 2018) was used. This means a societal improvement that I as a designer wish to contribute to was defined which led to the final outcome.
Chapter 7. Ideation & Selection

Content

7.1 Introduction
7.2 Method
7.3 Conclusion
What will you read?

This Chapter presents to you how the design directions were ideated on and how the selection of ideas was done.
7.1 Introduction

This chapter consists of two parts namely idea generation and idea selection. Idea generation explores the different ideas by ideating on the design directions, idea selection techniques are next used to select a few ideas from the pool of ideas.

7.2 Method

Idea generation --> Idea selection

Idea generation

The “how to” and the “brainstorming” technique was chosen from the Delft design guide (Van Boeijen, A et al. 2014) for generating ideas. First, each design direction was broken down into smaller elements using “how to” questions and next each how to question was ideated on using brainstorming. Each technique was used for a time interval of 5 min, 10 min and 15 min with a 2 min break in between. Digital workspace website Mural was used as the canvas ideate on.

Figure 7.1. How to & Brainstorming, Source. Author.png
**Idea selection**

All the ideas were plotted on an X-Y axis where the X represents Societal relevance and Y represents Scan Car relevance. The ideas present in the top right corner of the axis were chosen for further development.
7.3 Conclusion

In this chapter, different design directions were ideated on using different ideation techniques and ideas were chosen by plotting them on an XY axis. The next chapter describes what insights were achieved by these steps and also the change statement is stated which entails the change that will be strived for.
Chapter 8. Concepts & Reframing

Content

8.1 Introduction
8.2 Concepts
8.3 Reframing
8.4 Conclusion
What will you read?

This Chapter presents to you two Concepts that were formed from the selected ideas and this Chapter talks about how the initial problem statement was reframed.
8.1 Introduction

This chapter describes the concepts that were developed from the selected ideas and states the reframed problem statement.

8.2 Concepts

Selected ideas were converted into concepts and these concepts were communicated via storyboards. Here two concepts that were developed have been described here.

**Concept one: Here I am**

![Concept Image](image1)

The images show the conceptualised version of a new parking system. Here lamp posts are shown to be fitted with equipment that is looking for a particular signal to pingback.

![Concept Image](image2)

When it receives the ping (here the ping originating from the car) it becomes aware of the location of the car.
And the equipment in the lamp post has a certain range which helps it know the location of the car at all times. When the device knows the car has been parked in the parking zone it sends a signal to the device in the car which initiates the parking meter.

Which the user can always check from his/her smartphone. Once they move the car away from the parking zone the final cost of parking is presented to them.

These images describe the user experience this concept attempts to materialise.
Anywhere in the city a user would just have to park their cars in the right parking spot and walk away.

Once they move their car again they would receive their parking ticket and if the car is not parked at the right spot they would also receive a notification on their phone about it. As the device within the car channels, this notification to the user the privacy of the users can also be kept secure as the only thing the authorities sees will be a dot that indicates the vehicle's location.

**Why this concept?**
This concept tries to provide an additional means to ensure people pay for their parking tickets other than the use of enforcement by using Scan Cars. This concept attempts to make your parking tickets payment method so easy that you don’t have to be enforced to pay for your parking. As this concept is not inclusive of all citizens from society there would still be a need for enforcement in place.

This concept was partly inspired by a news article shown in the image. The news article states that in the Netherlands a number of prisons had to be closed down because there weren't enough prisoners in the country. These are of course very positive developments. The systems in the country must be doing something right that has led this to happen. In order to reach the desired scenario (shown in the image) the first step was seen as providing users easiness to be able pay for their parking ticket.
Figure 8.1. The Netherlands closing its prisons, Source. The Week, 2018.png

City stops enforcing people to pay for their parking tickets as new stats suggest 95% of Amsterdammers pay their ticket when they park

Figure 8.2. Desired scenario, Source. Author
In order to explain the concept, the story of Marcus and Anthony is presented who one day come across a Scan Car and they wish to know more about it. Anthony knows about an application called Mr Sensor where he knows he will find his answers. So together they explore the application and it gives them the answers to their questions. The concept here is trying to address the information needs that citizens have regarding various devices that are around them and in their city.
**Why this concept?**

This concept presents benefits to stakeholders. For the municipalities, the application could be a step towards their digital city ambitions. It contributes particularly well towards being an “inclusive digital city” as it can potentially help in providing enough information to citizens for them to raise their voice either against or for the devices in their cities. For businesses, it reduces a bit of uncertainty of the impact their devices are having on people’s lives as they receive regular feedback from citizens.

Some of the features of this application were inspired by the work that has been done on transparency in certain parts of the world. Personal data processing in public space (Gemeente Amsterdam, 2020), Atlas of Surveillance (Electronic Frontier Foundation, 2020), A privacy infrastructure for the IoT (cmuCyLab, 2020).

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**8.3 Reframing**

How can the "Principles for Accountable Algorithms and a Social Impact Statement for Algorithms" be used to develop a strategic framework for responsible AI innovation in Amsterdam.

The initial problem statement was reformulated into a change statement that would guide the development of the Mr Sensor application.

**Change statement**

*I want citizens to get well informed about what devices are doing in public spaces so that they can help authorities decide what is best for them.*

---

**8.4 Conclusion**

In this chapter, two concepts were shown and the reformulated problem statement was described.
Part 3

Concept Development - Validation
About Concept Development

This part of the design process explored how the knowledge of the literature could be translated to an everyday practice. Here the leap to bridge the implementation gap was to use the suggestions from the literature and converted them into design requirements.

About Validation

In order to better understand the feasibility and viability of the concept. Validation sessions were done with them and the suggestions that they gave out were used to improve the concept.
Chapter 9. Concept Development

Content

9.1 Introduction
9.2 Method
9.3 Change Statement
9.4 Metaphor
9.5 Transparency
9.6 Requirements
9.7 Concept
9.8 Components
9.9 Conclusion
What will you read?

This Chapter describes the complete process that used to develop the concept
9.1 Introduction

In this chapter, the process of developing the Mr Sensor application has been explained and the developed concept has been presented.

9.2 Method

Change statement --> Metaphor --> Literature review (transparency) --> Requirements --> Components

For developing the concept further, the change statement was refined, and a metaphor was chosen that expressed the desired relationship between the citizens and the authorities. The value of transparency was seen as a means for achieving the desired relationship so a literature review was done to understand transparency and to know how transparency can be achieved in ICT devices. From the literature, requirements were extracted and different components of the app were built considering these requirements.

9.3 Change Statement

The refined change statement specified the type of device in the public space.

I want **citizens** to get well informed about what data collecting devices are doing in public spaces so that **citizens** can help **authorities** decide what is best for them.

Citizens: Anyone who can log into the application is described as a citizen

Authority: Organisation/person who owns the data collected by the device is the authority.

9.4 Metaphor

Relationship between a parent and a child has been used to describe the desired relationship between the authorities and citizens. A parent is typically responsible for making sure their child knows what things in his/her surroundings are going to harm them and ensure that they are guarded from being harmed. Similarly, here it is desired that authorities ensure that citizens are made aware about the various data collecting devices in the city and ensure that citizens are safeguarded from any potential harm that these devices can cause.

9.5 Transparency

In the dictionary, transparency is defined as the “condition” of being transparent like the transparency of ice. In the context of science, engineering, business, and humanities, transparency is defined as “Operating in such a way so that it is easy for others to see what actions are performed” (Transparency (behaviour). 2020), often the specificity of what is meant by transparency changes in different contexts and the definition can also depend on what is being designed. For example, information transparency is defined as “the degree to which information is available to outsiders that enables them to have informed voice in decisions and/or to assess the decisions made by insiders” (Florini A. 2007) and in the case of organizational transparency, it is seen as
the tendency of the organization to be open in communication.

Nowadays there has become more and more dependency on information systems to measure an organization’s performance which takes into account the policies, regulations and control systems and also many business processes are supported and executed by a software application. Thus it makes sense to design for the value of transparency explicitly. It is important to note there are certain values that are in conflict with transparency when we are designing for it. Values of tradition, secrecy, profitability, and even a human weakness such as shame. And when we are designing, it becomes a matter of tradeoffs.

In recent times there has been a surge in the popularity of “open data”, governments have been urged to open up the data they control (Zuiderwijk A. et al. 2014). In this case policies and guidelines for officials need to be designed that help them decide which databases need to be opened up for the public. Here the values of bureaucratic or political secrecy are against the idea of “open data” as secrecy helps promote national security interest, advance self-serving agendas, evade controversies and also thwart accountability.

Then there is information transparency that is used to help citizens make well-informed decisions through the disclosure of (secured) information. Information transparency can be defined as “the degree to which information is available to outsiders that enables them to have informed voice in decisions and/or to assess the decisions made by insiders” (Florini A. 2007).

Procedural transparency (Weber RH. 2008), It is about making comprehensible and explicit rules that define how the information is produced. An example of this would be the ability to see the history of who edited, deleted or added information on Wikipedia or even different Wikis available for anyone to see (Weber RH. 2008).

Procedural transparency should help increase reliability and trust in the source. Discussion on transparency as a value is happening in many fields in a computer simulation (Friedman B et al. 2006), software development (Leite JC et al. 2010), Interface design (Norman DA. 1998), System engineering (Bannister F. 2011) and there have also been debates on open-source coding.

**Threats**

ICT has shown that by making information public it can make corporations be honest, fair and accountable. But it can be of little use if those in power do not want this to happen (Bannister et al. 2011). Even if the information is being shared it will be disclosed strategically. ICT rarely discloses information that has not been vetted for public consumption (Elia J. 2009). And corporations will not be willing to share information that holds them accountable and often only the positive aspects are emphasized. In the context of e-government trust in public processes can not be achieved by technology alone, the structures of the governments need to be changed too. It becomes a political issue, rather than a technical one. ICT can thus enable transparency but it can not guide it. Values tensions that were mentioned earlier, tradition, secrecy and profitability. Play their role here as well. Secrecy can ensure corporations can evade accountability and even maintain profitable financial transactions when decision-making processes are not clear. Though in some circumstances secrecy can be understandable. When trying to protect personal identity, plans before they are executed or plan to be released.
Things to avoid
When designing for transparency things like information overload need to be avoided. For example, research has shown that not a lot of people actually read privacy regulations on the internet (Kelley et al. 2009). It is important to understand the user’s information needs and present them with the most relevant information (Bannister et al. 2011). Incomplete, misleading or false information also needs to be avoided. Credible and verifiable sources of information need to be made available. The aspect of cost can also play a role. The complete process of collecting, organizing and sharing is a time-consuming process and the process will continue to happen as long as the budget is available.

It is important to note that transparency enabled via ICT runs the risk of being shallow, partial, superficial or even being biased to corporate interests which can be more damaging than none at all (Elia J. 2009). And providing limited transparency may avoid disclosure which is truly relevant to stakeholders. (Elia J. 2009). These risks must be prevented and limited if transparency is to be achieved via ICT.

9.6 Requirements

R1: Provide relevant information
It is important to understand the user’s information needs and present them with the most relevant information (Bannister et al. 2011). Here relevant information has been presented in the form of users information needs that were identified from the generative sessions in Chapter 5. The category “want to know” from the theme “Things that can change” talks about the different information needs users to have.

Information needs
How do the devices work?
Who runs the devices?
What are they being used for? (functionalities)
What data is being collected?
What is happening to the data after it is collected?
How is the data being used/ reused?
How is the data stored?
Who has access to the data?
What are the potential use cases being considered for these devices?

<table>
<thead>
<tr>
<th>Theme</th>
<th>Category</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Things that can change</td>
<td>Improved Scan Car</td>
<td>Secondary function</td>
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<tr>
<td></td>
<td></td>
<td>Societal benefit</td>
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<td>Transparency</td>
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<td>Lack of awareness</td>
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<td>Helping with stress</td>
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<td></td>
<td>Little leeway</td>
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<tr>
<td>Want to know</td>
<td>Unknown working</td>
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<td>Unknown future use</td>
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<td>Unknown data storage</td>
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<td>Unknown functionalities</td>
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<td>Who runs it</td>
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<td>Why know</td>
<td>Need for understanding</td>
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<td></td>
<td>What if an accident</td>
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<td></td>
<td>Privacy</td>
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</tbody>
</table>

Figure 10.2. Codes of information needs of Users from Generative Sessions, Source. Appendix 2.6
R2: Provide complete information
Incomplete, misleading or false information
needs to be avoided.

R3: Provide credible/verifiable sources of
information
Credible and verifiable sources of information
need to be made available.

R4: Easy to understand and concise information

When designing for transparency things like
information overload need to be avoided. For
example, research has shown that not a lot of
people actually read privacy regulations on the
internet (Kelley et al. 2009).

R5: Allow citizen participation
In order to help authorities decide what is
best for citizens, citizen participation in the
discussions regarding the devices is necessary.

9.7 Concept

Upon installing the Mr Sensor application the user has to first login and then is presented with five
tabs. The first tab is About which explains what the purpose of the application is.
The second Tab Around you using the maps feature gives users the ability to know what data collecting devices are around them and by the usage of simple icons, it informs citizens about what data the device is collecting and for what purpose.

If users wish to know more about the device with regards to (information needs):
How do the devices work?
Who runs the devices?
What are they being used for? (functionalities)
What data is being collected?
What is happening to the data after it is collected?
How is the data being used/ reused?
How is the data stored?
Who has access to the data?
What are the potential use cases being considered for these devices?

They can by clicking on the icon which presents them with more information. The information here has been presented by the means of icons, concise text and videos that talk in length about the working of the device and specific information about what is happening to their data. Lastly, users have the option to respond to what has been presented to them in the form emojis and text that they can input.
Tab Your City gives users the ability to look up data-collecting devices not just in their city but also in cities where such a database is available.

Information tab provides users with information regarding the types of devices present in the city and types of data that is being collected. And lastly, the share tab gives users the option to share the application with anyone they like.

9.8 Components

The app mainly consists of four components which have been described below.

<table>
<thead>
<tr>
<th>Components</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Addresses information needs</td>
<td></td>
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<tr>
<td>Credible source of information</td>
<td></td>
</tr>
<tr>
<td>Easy to understand</td>
<td></td>
</tr>
<tr>
<td>Enables Citizen participation</td>
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</tr>
</tbody>
</table>
Byte sized information is presented in order to avoid information overload and the questions identified in requirement one is addressed via the use of icons, a limited number of words and videos.

**SCAN CAR**

- Legal stamp required
- How is the data collected?
- What data is collected?
- Who owns the data?

**Device**
- Camera

**Data collected**
- Face
- Location
- Number plate

**Data owner**
- Gemeente Amsterdam

**Description**

Scan car are vehicles equipped with cameras that are primarily used by the municipality to check if the parked cars have paid for their parking ticket. They are also used for locating stolen vehicles.

**About Scan Car**

What happens to the data?

**Your data journey**

How does it make you feel?

Would you like to share with us why?
Credible source of information

A tick mark beside the device is supposed to show citizens that the information provided here is credible. Meaning the information has been audited by a 3rd party legal organisation who audits the information to ensure the information is not incomplete, misleading or false.

Easy to understand

Development of easy to understand simple icons ensures the information is concise and relevant.

Tip: Click on the icon to know more

Devices
- Camera
- Sensor
- Beacon

Type of data being collected
- Face
- Location
- Object
- Temperature
- Air
- Smell
- Light
- Sound
Having ways to express how the device makes you feel and be able to express your thoughts with the community in an open forum format ensures citizens continue to have a say in the devices around them.

9.9 Conclusion

In this chapter how the first version of the concept was developed has been described and in the next chapter how the concept was evaluated and iterated on has been narrated.
Chapter 10. Validation & Iteration

Content

10.1 Introduction
10.2 Method
10.3 Feedback One
10.4 Iterated Concept
10.5 Feedback Two
10.6 Conclusion
What will you read?

This Chapter describes how the concept was validated, the feedback that received and one version of the iterated concept is presented.
10.1 Introduction

This section describes how the Mr Sensor application concept was validated and how it was improved from the feedback.

10.2 Method

Experts were consulted for evaluating and improving the application. The method involved creating a session plan, approaching experts and gathering feedback.

Creating a session plan --> Approaching experts --> Feedback--> Iteration--> Feedback--> Final concept

Session plan

Visual collaboration software Mural was used for the session. A one-hour session plan was created. The agenda of the session looked like this.

<table>
<thead>
<tr>
<th>Agenda</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Concept (2 min)</td>
</tr>
<tr>
<td>2. Purge (3 min)</td>
</tr>
<tr>
<td>3. Concept design (5 min)</td>
</tr>
<tr>
<td>4. Component discussion using CQ (20 min)</td>
</tr>
<tr>
<td>5. Conclusion (10 min)</td>
</tr>
<tr>
<td>6. Feedback (5 min)</td>
</tr>
</tbody>
</table>

Figure 10.1: Evaluation session agenda, Source: Author

Concept was first presented to the expert in the form of images that constituted the different screens of the application. The expert was given their space to go through the images quietly. Sometimes they preferred to express their thoughts out loud that was also encouraged if they preferred it that way.

In the Purge, experts were given time to reflect on the things that they had just seen. Whatever initial thoughts they had they would type them down on a sticky note. These thoughts generally would be the things that they liked, disliked, had a question about or a critic that they had on the concept.

Figure 10.2: Application screens as presented to experts, Source: Author

Figure 10.3: Example of a Purge done by an expert, Source: Evaluation session
In concept design, the concept is presented from a designer's perspective as to how the concept was arrived at. The aspects explained in chapter 9 change statement, metaphor, the value of transparency, requirements and components were explained to experts.

Next, all the aspects of the application were discussed using critical questions (CQ). A bunch of questions adapted from Atkinson et al. (2007) was used for discussion. Atkinson et al. (2007) provide a way for challenging the underlying assumptions for an argumentation. Here the simplified version of the questions was used. Experts were encouraged to write down their views, opinions on a sticky note while expressing them.

Critical question CQ1 is about the accuracy of the current system description. CQ2 is about the effectiveness of the components; CQ3 is about the effectiveness of the requirements specification, in meeting the objective. This involves two questions: adequacy refers to the question of whether R is enough to achieve O (Change statement). Necessity refers to the question of whether no requirements can be left out. This is related to efficiency, in a way. One wants to achieve objective O with as little demands as possible. Note that there may be several ways of achieving the same objective. CQ4 considers whether the resulting system as a whole will promote the value. CQ5 considers alternative solutions. CQ6 considers possible negative side effects. Typically, the costs of an investment are listed here. CQ7 considers the feasibility of the solution. In other words, are the assumptions on which the reasoning is based warranted? Finally, CQ8 considers the relative worth of the value itself.

Lastly, if there was still more time left during the session a conclusion of the session and feedback for the session done.

**Experts**

In total eight sessions were conducted with ten experts. Almost all the sessions were conducted one on one for an hour with an exception of one session which had three experts and with the session lasting for 90 min. Experts that were part
of the session were:

4x Strategic Designers
Interaction designer
2x design experts
Member of the municipality
Smart City consultant
Member of TADA bureau

10.3 Feedback one

Four sessions with six experts were done before the first iteration was done on the concept. Plenty of feedback was received from the first three sessions. Here the summarised/relevant version of the feedback has been described.

Requirements

Requirements

R1: Provide relevant information
Information needs
How do the devices work?
Who runs the devices?
What are they being used for? (functionalities)
What data is being collected?
What is happening to the data after it is collected?
How is the data being used/ reused?
How is the data stored?
Who has access to the data?
What are the potential use cases being considered for these devices?

R2: Provide complete information
R3: Provide credible/verifiable sources of information
R4: Easy to understand and concise information
R5: Allow citizen participation

Figure 10.6: List of requirements as presented to the experts, Source: Author

Figure 10.5: Snippet of a complete session, Source: Session 2
What changes are needed in the requirements?
- Requirement R2: Provide complete information contradicts with requirements R1: Provide relevant information and R4: Easy to understand and concise information. So this requirement can be removed.

- When comparing the Change statement to requirement R5: Provide citizen participation. The requirement R5 is very much underdeveloped. Either the scope could be adjusted by focussing only on transparency or participation, or more requirements can be added just like R5.

What were the suggested requirements that could be added?
- At the moment the app lacked a fun element that could draw people in to use the application so having a fun element in the app could ensure people would use the application. Some ideas that were suggested for this: Having a gamification element, AR game or guerilla campaign that promoted the application.

- To ensure that organisations use the application an incentive could be provided to them. These incentives could be partnerships, for brand recognition, or maybe it is not about giving an incentive but making changes to policies that force them to use the application.

- Have features for long term engagement with users. This could be a news feed or a social platform that is each neighbourhood on their own.

![Figure 10.7: Feedback given on requirements, Source: Evaluation sessions](image)

![Figure 10.8: Suggested requirements that can be added](image)
- The application should ensure feedback is taken from citizens and update must be given citizens as to what was done with their feedback.

Possible actions that were considered has been shown in the image.

![Image](image.png)

**Figure 10.9: Actions that will be taken from the feedback, Source: Evaluation sessions**

**Components**

- **Addresses information needs**
  - Credible source of information
  - Easy to understand
  - Enables Citizen participation

![Image](image.png)

**Figure 10.10: Components list, Source: Author**

![Image](image.png)

**Figure 10.11: Component address information needs as presented to the experts, Source: Author**

![Image](image.png)

**Figure 10.12: Reaction to the component and Actions to be taken from the feedback, Source: Evaluation sessions**

- Developing R5 and adding more requirements
  - Provide incentives to stakeholders to use the application

- Citizens should be given the power to influence the process
  - Citizens must be given feedback on what happened to their input

- Remove R2

- Citizens must be engaged
  - Application should be feedback oriented
Some of the feedback received for the component:
- The use of icons, concise texts and videos, in general, was seen as good means for addressing the information needs. Alternatives ways were suggested that could improve this further was by making it more interactive and engaging, though this same strategy would mean users would take more time to take in the complete information.

- A remark was made that videos the way in which they were presented were not self-explanatory to what they were about. Adding description was suggested.

- Lastly, it was suggested the best way to know the right means for addressing needs would be to do plenty of user tests with different kinds of designs.

Possible action that was considered had been shown in the image.

Some of the feedback that was received for this component:
- Almost all experts were of the opinion that a mark like this can be a good addition to the application.
- Though the organisation who gives the mark becomes important as trust in such an organisation will be necessary.
- There were multiple opinions as to who should be the one giving such a mark some believed it could be an authorised 3rd party and some believed it shouldn’t be a single organisation but multiple organisations who check each other to ensure the information is correct.
- Lastly, it was pointed out that such a system might require a tremendous amount of work.

There were no further actions considered for this component.

![Credible source of information](image)

Figure 10.13: Component credible source of information as presented to the expert, Source: Author

![Reaction to the component](image)

Figure 10.14: Reaction to the component, Source: Evaluation sessions

![Easy to understand](image)

Figure 10.15: Component easy to understand, Source: Author

![Reaction to the component and actions to be taken from the feedback](image)

Figure 10.16: Reaction to the component and actions to be taken from the feedback, Source: Evaluation sessions
The feedback that was received for this component:
- Icons were seen as a good means of communication.
- It was suggested to test it with users to check if the icons are well understood.

Possible action that was considered has been shown in the image.

Miscellaneous aspects
Feasibility

Some of the opinions that they had on feasibility:
- The application in general was seen as feasible to make but getting people to use it could be a challenge.
- There would be a need for ownership to be shown by the municipality, the application would have to be kept up to date and there would be a need for a person who would translate technical aspects of the device well understood by everyday citizens.

Clarity

There were plenty of questions posted with regards to the application. All the questions have been shown here. These questions were considered when iterating the concept. Like


Figure 10.21: Things that are still unclear about the concept, Source: Evaluation sessions

Figure 10.22: Things that were liked about the concept, Source: Evaluation sessions

10.4 Iterated concept

There were many aspects that were thought to be good about the application some of them that were mentioned have been shown here in the image.

In order to improve citizen participation in the application, first, the level of participation that was going to be worked towards was defined. Here Arnstein’s ladder was found to be helpful.

The ladder is a guide to see who has power when important decisions are being made regarding a project or certain aspects. Ladder step 1 Manipulation indicates that citizens have close to zero power with regards to decision making and Step 8 Citizen control indicates that citizens have complete power over the decision making of the projects involved. And this application strives to achieve step 3 to 5 also termed as Tokenism.

Informing can be seen as an important first step toward legitimate participation and just so that it does not end up being just a one-
way communication medium the aspects of consultation and placation were also chosen to be worked towards. Consultation would involve conducting surveys, polls, ideas, enquiries from citizens and Placation would involve selecting a few specific individuals who would work closely with the authorities to advise on how things should be done. It is important to note that the final decision maker in tokenism is still retained by the authority.

Requirements

R1: Provide relevant information
R2: Provide credible/verifiable sources of information
R3: Easy to understand and concise information
R4: Give opportunity to get complete information
R5: Allow citizen participation
R6: Provide incentives to stakeholders to use the application
R7: Should be feedback oriented
R8: Give feedback to citizens on the input that they provide

The requirement R2: Provide complete information was removed and additional requirements from R6 to R8 were added.

Components

- Questions were added on top of the videos to give clarity to what the video is about.
- Ability to react, share, flag the contents of the device option was added on the top right corner.
- At the end of the content, a drop-down option is provided which gives users the options to read FAQ, ask a question, give feedback or participate in programs that the data owner has it running.
- When giving feedback citizens were forced to specify what aspect they were giving feedback on.
- In general Tabs About, Your city and share tabs were removed and in their place. News, Participate and Profile were added.
- In the participate tab, users can Vote, Participate in polls, give out ideas or assess ideas, participate in surveys, apply to programs that authorities have running in the city and users could also now propose their own projects.
The about page was updated and the description of the app was moved to the installation page.

The app still contained the login page. After logging in the users are now presented with five tabs with three tabs from before replaced with three new tabs. The News, Participate and Profile now replacing About, Your city and Share tabs. In the News tab, the users are presented with news about their digital/smart city initiatives and updates.
The Around you tabs initial interaction remains the same.

The screen that provides users with more information about the device remains the same for the most part with functionality to react, share, flag the device options getting added to the top right corner and drop-down options provided to users at the bottom of the page which gives users the options ask a question, provide feedback, or participate in existing programs.
Participate tab allows users to be able to participate in polls, vote, give out ideas, be part of surveys, and apply to programs that authorities have running and in return citizens can receive monetary or non-monetary benefits for their participation.

The information tab remains exactly the same. The profile tab is added which gives users the option to see their recent activity within the app, get status updates on their proposals and feedback and lastly three options of notifications that they receive from the app, settings and the option to sign out.

10.5 Feedback two

The feedback from session five to session eight on the iterated concept has been described here.
For the About screen it was advised to mention the privacy statement for the application that complies with the GDPR policies.

It was critiqued that in a city any citizen should be able to give feedback and participate anonymously.

The feedback that was received on the component Address information needs: The information that is needed to be provided to comply with the GDPR is missing. Article 15 of GDPR: Right of access by data subject mentions the information that needs to be provided. Some feedback was also received on the UX aspects of the design.

The map used in the app could be updated to a map that is publicly available by the municipality. With respect to presenting the first layer of most relevant data to citizens, it was suggested to focus on the actions that are being taken from the data that is collected.
Feedback on the feasibility of icons like these was that icons like these are good for public debate by in practice they are harder to make as they not so obvious for all devices.

**Miscellaneous**

Aspects that needed to be strengthened and clarified from the application standpoint has been shown in the image.

**10.6 Conclusion**

This chapter described how the concept was evaluated, what feedback was received and what was the iterated version. All the evaluation sessions canvases can be found in the Appendix 3.

Aspects that were liked by the experts have been shown in the image.
Chapter 11. Final Concept

Content

11.1 Introduction
11.2 Changes Made
11.3 Final Concept
11.4 Next Steps
11.5 Conclusion
What will you read?

The final version of the concept and next steps have been presented and described
11.1 Introduction

This chapter presents the final version of the concept and talks about the next steps that the municipality of Amsterdam should take to develop the application.

11.2 Changes made

In the final version of the application, the owner of the application was specified, the login functionality was removed, and small but an important addition was made to the page that describes more about the Scan Car to the user.

The owner of such an application should be the Gemeente but their role shouldn’t be to run the app alone, their role needs to be to promote the usage of the application and ensure that all the stakeholders in the city together maintain the application. If such an application needs to stay up to date and the information provided by the application is credible then it will need the help of multiple stakeholders who check upon each other to ensure its right usage.

The login functionality was removed as per suggestion given by the experts. The final change that was made to the application was providing users with information about the actions taken on the data collection.

11.3 Final Concept
11.4 Next steps

This painting by Robert Meganck nicely depicts the fact that there will always be surprises and unexpected developments when a new technology is introduced in society. Practices that enable transparency and participation will certainly help in reducing the number of uncertainties new technology presents and will enable spontaneous ways of tackling them. The app can be one such platform that can make it happen. If it is chosen to be developed it would require plenty of work and here some of the recommendations have been described.

Create open registries
The municipality should make IoT registries publicly available for everyone so that anyone has the ability to add a device to the app.

Promote the application
The application will never be successful unless all the stakeholders in the city believe it is needed and in order to ensure the app stays up to date it must promote the app wherever it can.

Hire UX & UI designers
Privacy statements will have to be added about the app and also for all the devices that get shown within the app. One responsibility of the designer would be to ensure these privacy statements are expressed in means that are well understood by everyday citizens.

In order to develop the visual icons about devices and the data, it is collecting there will be a need to work closely with experts who can critique the accuracy of icons depicted and as collaboration is one of the strengths of a designer they can do a good job of it.

Formulate strategies for inclusion
The application is only one initiative towards transparency and participation the municipalities must explore other platforms as well that would achieve similar objectives.

Never forget the goal
Ladder of citizen participation (Arnstein’s ladder) was very helpful in the development of this application. The municipality must reflect at various times to check if the application is truly achieving the goals it had set out to achieve.

11.5 Conclusion

In this chapter, the final version of the application was presented and next steps that could be taken for the application were recommended.
Chapter 12. Personal Reflection

Content

12.1 Process
12.2 Learning Ambitions
12.3 Final Thoughts
What will you read?

Reflection on the project is spoken about.
There were a tremendous amount of things that were learnt in this project. I will be reflecting on it from two lenses the process and the learning objectives.

12.1 Process

The project was started with the mentality to explore different kinds of design methodologies and incorporate elements that I had never tried before. For the large parts, there were plenty of new things that I felt I succeeded in incorporating them but the exploration had its own pitfalls as it took up a good amount of time and when the new tools did not work out as intended it forced me to look back at my previous projects to see how I had tackled it before which was quite nice in its own way.

Lack of clear focus on the end deliverable of the project, in the beginning, caused delays in the project and this is something I will try to avoid in the individual projects that I do in the future. Incorporating experts during the development phase of the project is something that I found very helpful. The part that I liked the most about my process was incorporating the change statement. Change statement helped me concretely describe the kind of difference that I was trying to bring to this world. The best part of specifying them is that it helps to discuss the desirability of the change with all kinds of stakeholders easily.

12.2 Learning Ambitions

I had specified two learning ambitions at the start of the project.
Successful multi-stakeholder collaboration
An end deliverable that provokes a sense of action

In the complete project, about 20-25 people were either consulted, interviewed or involved in the different phases of the project. At the beginning, I did not specify what my parameters of success are but me just being able to break out of my comfort zone and reaching out to people is something alone I will take that as a success as it has taught me some very valuable networking skills. I am very happy with the end deliverable that I came up at the end of the project. I know that it has a high societal relevance and with the increase in presence of technologies concepts like these will continue to be more and more prominent. About the aspect if it provokes a sense of action, it still remains to be seen.

12.3 Final thoughts

This project has taught me to be resilient in times when going got tough. It made me aware of times when I am highly motivated and times when I am not. It made me love my master track strategic design all over again. To me, the strategic design will always be about the art of thinking about problems and solutions. How to design the right thing and how to design the thing right. These will be the two questions I will continue to ask myself throughout my future endeavours.
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