

THINGS AS CITIZENS

A STUDY ON THE MINGLING OF IOT WITH AGENCY
IN EVERYDAY URBAN CULTURE

LOUISE HUGEN

MASTER THESIS

01 RESEARCH

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Master thesis

Things as citizens: a study on the mingling of IoT with agency in everyday urban culture
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ABSTRACT

This master thesis contributes to the PACT research project. The PACT (Pure Air for Cities of Things) project aims to develop novel methods and tools for understanding and demonstrating how intelligent things can act in concert with people and connect to existing data and cloud services. The aim of this thesis is to identify design qualities for Things with agency to perform appropriately during shared practices with citizens according to urban culture. The focus is the notion of co-performance in the smart city: a concept that regards the practices of humans and Things with agency to be equally important.

The research of this thesis contains a literature review on Things, their characteristics and capabilities, the interaction between Things and the co-performance between Things and humans. This literature review serves as a vocabulary in order to understand the notion of co-performance in an independent context setting.

No literature research has been found on the co-performance of Things and citizens in the urban culture. Therefore practice based research by means of three participatory studies with Dutch citizens is conducted in order to gain new knowledge for this topic. The results of all three studies show a relationship between participants' values of public behavior and the values of a democratic society.

Concluding from the studies, a democratic dialogue is needed for the co-performance of Things and citizens. The results of both the literature study and practice based research are combined in a synthesis to identify the design qualities for Things. The result is a model of design qualities for Things as citizens in order to achieve appropriate behavior of Things with agency in urban culture.

PREFACE

This graduation thesis is the final result of two years studying for my master. During my study, I discovered my interest in system design and especially in the Internet of Things. I also discovered an interest in interaction design and I wanted to look more into this subject. During my search for a graduation assignment, I received the opportunity to be part of the research project that I have written my thesis for, the PACT project. Initially, I did not think about a research oriented project, however I am glad I chose one. Doing a research project enabled me to open up more for possibilities and to be more creative than I normally would. Maybe in the near future I would like to do a PhD, but for now I am happy to finish this graduation project.

During my graduation project, I have had the luck of many people willing to help me out. It has been a pleasure to work with so many people and to learn from all the experiences. My supervisory team, Elisa Giaccardi and Iskander Smit, were very nice people to work with. Elisa, thank you for your intriguing insights, you have shown me how to think about design from a whole other perspective. I was always surprised how you would come up with a new view or creative insight just in a moment. You also supported me throughout the project to keep on, even in times I did not know what I was talking about. Iskander, thank you for your support and time given to me throughout the project.

Your enthusiasm during the meetings has inspired me throughout the project. Not only did you help me by meeting me weekly, you also helped me to find participants, showed me Thingscon Salon and even more interesting, arranged for me to participate at Thingscon, which was a very special experience to me.

I would also like to thank Dave Kirk and Phil van Allen for meeting with me and sharing their views on Thing centred design and the research that I conducted. Your views have helped me to think one step further in my research process.

Thanks to all the participants of the creative session, contextmapping session and Thingscon workshop. During each session, everyone was very open to each other and it made it easy for me as a facilitator to lead the session and to enjoy what I was doing.

Special thanks to Jan, for listening to me for hours, when I was too excited or when I was doubting it all, you have been very patient and I am happy to have you by my side. Thanks to Mirte, Lot, Marije, Jozine and Emma for times that I needed IDE advice, for being my participant for my tests and for all the tea breaks. And last but not least my parents and Thomas for reading, listening and supporting, especially the evenings before my sessions or when I needed advice.



INTRODUCTION

Whereas a few years ago connected objects were an unknown phenomenon to society, nowadays they have made their way into our daily lives. Electronic consumer products such as the Nest thermostat and Philips Hue have made their way into our households. Within 5 years the expected amount of connected devices will reach to 50 billion (Evans, 2011). All these connected devices have the ability to connect via the internet to each other and to communicate without human interference (Rowland et al., 2015). The devices often have implemented sensors and are able to exchange information, often referred to as data exchange. This new system of connected devices is called the Internet of Things (IoT) and the devices are therefore called Things.

The Internet of Things is not only integrated in consumer products, it is integrated in the smart city concept as well; a digital layer added to existing cities that enables cities to become smarter. Integrated sensors in the urban infrastructure add a digital layer to collect data which can be used to improve our experience and life in the city. Commonly, this added digital layer is applied to achieve a more efficient use of space, energy and other resources. Nonetheless, the smart city concept can be used to enhance other multiple areas in the city as well, such as health, safety, efficiency and social aspects of a city (Smit, 2017).

Often, the purpose of the digital urban infrastructural layer is to collect data and to visualise this data on an interface, such as an application, to communicate data insights to humans (Cila et al., 2017). The smart city concept is therefore limited by its capabilities to measure and reveal data and is not able to operate based upon its own insights. As technologies as Artificial Intelligence (AI) are developing and becoming integrated into consumer products, enabling products the capability of pattern recognition and learning (such as Nest), it is time to consider the possibilities for Things to act upon their environment and humans. In other words, what if these Things will get agency too?

If Things with agency become part of the city infrastructure, they will exist in concert with citizens and will have the ability to perform practices beside citizens. Hence, they will have an influence on citizens, their direct environment and the overall performance in the city. From this point, citizens and Things will need to find a way to co-perform: to share and co-operate their practices in the everyday life

in the city. Yet, there is a lack of empirical data and demonstrators for this concept (Giaccardi & Smit, 2017).

The aim of this master thesis is to explore the notion of co-performance between Things and citizens in the smart city context. The result is a collection of qualities serving as design criteria for Things with agency in the city. A solely user-centered approach would not be enough for this research; both humans and Things have the ability of agency and should be acknowledged as equal performers. Therefore, the metaphor citizen is introduced to regard both as active members of the city and to reflect upon findings of the research with this view in mind.

The thesis starts with a chapter describing the project; setting the theme, the aim and objectives, scope and the approach of the research. The second chapter presents a literature review about Things with agency, serving as a vocabulary that is used for the synthesis of the results. The third chapter introduces a generic model about democratic "civism", good citizenship, and serves as a translator for the citizen metaphor. The fourth chapter shows four empirical studies, which are all four participatory sessions with focus groups. The research topic is the public behavior of human citizens and is used to explore how Things should demonstrate their behavior in the city. The model in chapter three will be used as a tool to synthesize the results of these empirical studies. In chapter five the results of the empirical studies are reviewed with the vocabulary of chapter two, in order to identify the design qualities for Things with agency. Chapter six summarizes the model of design qualities, as a result from previous chapter, and serves as a conclusion simultaneously.

CONTENT

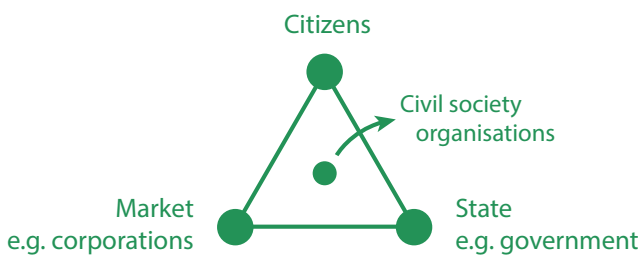
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1. PROJECT

1.1 BACKGROUND

The term smart city can be understood in multiple ways. In this project, smart city refers to a city that utilises IoT to meet the demands or needs of its citizens. The Smart city is also referred to as 'the sensing city' which gathers data through integrated sensors. For future practices, as discussed in this thesis, one can also see the smart city as an 'assemblage', a group of actors, both human- and non-humankind (de Waal, 2015a).

The smart city itself, however, does not exist physically. One can rather envision the smart city as a the mix of a vision and a performative term. This vision can be seen as a collectively recognized flag by various parties and allows to (re)shape the city according to the smart city vision (de Waal, 2015a). Four main stakeholders that play a role in the smart city making are visualised in figure 1.1. The smart city has brought new opportunities to the stakeholders through insights based upon data analysis about city processes. Moreover, the smart city concept connects stakeholders easier.



▲ Figure 1.1: The main stakeholders of the smart city.

From governmental influence towards empowered smart citizens

The smart city concept has been approached in different ways by its stakeholders, whereby all stakeholders have different roles (de Waal, 2015a). The first approach mainly revolved around the optimization of all kinds of urban processes. By this means, the government has considerable influence on the outcomes and the citizens have a passive role as they can only interpret data, but have no input on the processes themselves. This smart city approach did not address the added value and contribution to the city experience and does not actively involve citizens.

A new approach appeared whereby the smart city is centered around the creation of an innovative milieu and decentralized from the technology itself. Cities try to attract the right facilities such as talent and the right

companies (e.g. Google with the Sidewalk project) to stimulate innovation. The approach also encourages open innovation, design thinking, hackathons and living labs. Citizens are hereby seen as co-creators and stakeholders in the innovation process of the creative city. Yet, this approach did not address the more democratic dimensions of citizenship and is therefore not directly or by itself contributing to the city experience as well.

A countercourse for both approaches is called Smart Citizens. It strives to include individuals, communities and small business to prevent a sole focus on global challenges. For example, IoT is now applied to enable citizens to organise themselves around issues of collective interest, also called DIY citizenship. Herewith civil society organisations are introduced to organise the DIY citizenship. It creates a democratic dialogue where citizens, designers and the state share control. Examples of such organisations in the Netherlands are: the Things Network, Waag society and the AMS Institute. This approach has gained much popularity and shows how important citizen involvement is for the creation of the smart city concept.

The urban culture

The urban culture within a city is created by citizens all living together in one urban environment. The distinctive feature of the urban culture is that it consists of constellations of strangers: people who do not know each other, not personally nor categorically, yet who have to find out a way to live together (de Waal, 2015b). That is an opportunity for citizens (can others be potential customers, give friendship, or teach me something new?) as well as a challenge (can I trust these strangers?).

Mumford regards the city as a marketplace as well as a theatre (de Waal, 2015b). Supply and demand are assembled spatially; in the city strangers come together physically to interact with each other. Moreover, the public spaces function as a theatre; citizens act out their lives for others to be seen. Both enable citizens to get familiar with strangers around them; it provides the opportunity to identify or distance themselves from others. At the same time, the theatre forms clues of how to behave in public space by the 'sets' or scenes that citizens act. Cities can be seen as communication systems that are based on the interface between individual and communal identities and shared social representations (de Waal, 2015b). The role of the city is to be a common place and to support community. It is a concept that unites citizens, even if they are all different from each other.

The role of Things with agency in the city

The emerge of smart technologies in the city has promised to solve societal issues, improve efficiency, make life easier and to take over work and responsibilities of people. Yet, this 'Smart utopia' is at odds with the unpredictable and messy everyday life (Kuijjer & Giaccardi, 2017). Smart or intelligent Things and their hidden assumptions have unintended consequences within the urban culture in the city. At this moment, artefacts are seen as a means for practice. They have a passive role and help us with the performance of human purposes, e.g. a lawnmower is used as a tool to sustain the public gardens. However this supplementary role does not fit anymore with the upcoming Things with autonomous behavior (Kuijjer & Giaccardi, 2017). Things that can act interdependently contain a form of agency: they contain the ability to perform practices beside humans. In this case, Things have an active rather than passive role and therefore need to be regarded as collaborators in achieving human originated purposes.

For practices, humans have socially shared, materially embedded ideas of how to appropriately perform them. These ideas of appropriate behavior describe what works and what makes sense. They are based on emotion and motivational knowledge of humans. What is an appropriate performance is thus a human judgement, an ability that Things lack. Therefore, it is crucial that both Things and humans have appropriate roles in the performance of social practices (Kuijjer & Giaccardi, 2017).

The introduction of Things with agency in the city means that they will perform social practices together with citizens in the public environment. As described in the previous paragraph, the urban culture shapes the idea of how citizens should act appropriately in public. The challenge of the introduction of Things with agency in the smart city is thus to support appropriate shared performances between Things and citizens according to the unspoken rules of the urban culture.

The research project PACT (Pure Air for Cities) researches this topic by generating, prototyping and validating design hypotheses for flexible and responsive urban infrastructures by a collaboration with companies, cities, citizens and intelligent things together. The aim of PACT is "to develop novel methods and tools for understanding and demonstrating how intelligent things can act together with people and connect to existing data and cloud services". The chosen context for the research project is urban air purification; however the results are

expected to be applicable in other contexts as well; e.g. mobility, circular economy, etcetera. This thesis contributes to the PACT research project.

1.2 AIM AND OBJECTIVES

The thesis focuses on the notion of co-performance in the smart city: a concept that regards the practices of humans and Things with agency to be equally important. Herewith, the capabilities and role division play an important role in the shaping of social practices between Things and citizens.

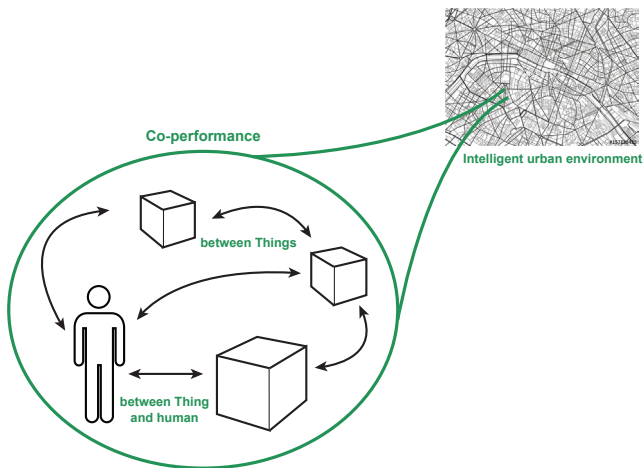
The aim of this thesis is to identify design qualities for Things with agency to perform appropriately during these shared practices according to urban culture. The metaphor citizen is used to explore how Things can become part of the urban culture in the city in their own kind of way.

The following sub research questions are set up for this research:

- 1. What requires a Thing (intelligent object) to act as a citizen?*
- 2. How should Things in the city co-perform with a human in a one-on-one interaction?*
- 3. How should a small system (~ 3 objects) of Things operate together in a city environment?*
- 4. What are the qualities for Things in the city based upon the results of the previous sub research questions?*

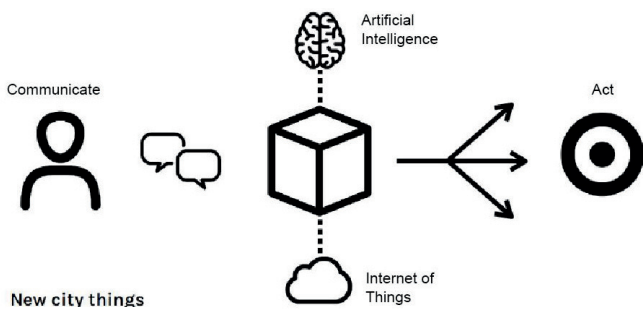
1.3 SCOPE

The scope of the research is a system of one human and a small group of Things with agency (three Things) in an intelligent urban environment. See figure 2 for a visual depiction. The studies within this research have been conducted in the Netherlands and are therefore only applicable for the urban culture of Dutch cities. Within this project, it is acknowledged that designers and their design decisions have an influence on the behavior of Things. Nevertheless, the scope of the project is the co-performance of Things and citizens and studies therefore solely the agency delegation between these two parties.



▲ Figure 1.2: The scope of the project.

A Thing with agency represents a physical everyday object in the city, either private or public. This type of Things are connected to other Things and to the cloud. For this thesis, Things assess a form of Artificial Intelligence (AI): the ability of embodied learning by pattern recognition in order to interpret and process data. With this function they are able to act upon the environment or to communicate or act upon citizens. An overview of all these functions can be seen in figure 3. From now on throughout the thesis, a Thing will refer to this definition.



▲ Figure 1.3: The definition of a Thing.

1.4 APPROACH

The research started with a literature review on Things, their characteristics and capabilities, the interaction between Things and the co-performance between Things and humans. This literature review served as a vocabulary in order to understand the notion of co-performance in an independent context setting. The vocabulary served as a support in order to answer research questions 2 and 3, as defined in section 1.2).

No literature research has been found on the co-performance of Things and citizens in the urban culture. Therefore practice based research by means of participatory studies with Dutch citizens was conducted in order to gain new knowledge for this topic. Practice based research means that knowledge is gained by means of practice and the outcomes of practice (Candy, 2006).

The first aim of this research was to discover the urban culture, public behavior in particular, and to frame the appropriate behavior for citizens in the urban environment. The second aim was to discover how citizens imagine Things to fit into this urban culture regarding the behavior of a Thing. For this practice based research, three different empirical research methods were applied:

1. A brainstorm session on the notion of **citizen** and about the desired and undesired behavior of citizens in a public environment.
2. A contextmapping session to discover the public behavior values of Amsterdam citizens. During this session, participants will reflect upon their ideas of Things in the city. Provotypes are generated which stimulate discussion. These provotypes are provocative demonstrators of Things with anti-social behavior and are based on Critical design. Critical design applies a speculative design proposal to challenge narrow assumptions and preconceptions about the role that artefacts play in the everyday life (Dunne & Raby, 2017).
3. A creative session to discover Dutch citizens' ideas about appropriate and inappropriate behavior of Things in the city.

The insights of the empirical studies will answer research question 1 and form the basis for research question 4.

The conclusion of both the literature review and the empirical research will lead to the answer for all four research questions. A synthesis is created in order to respond to the research questions. The conclusion of this synthesis leads to qualities for Things in the city.

2. THING VOCABULARY

A literature review was conducted in order to create a vocabulary that can be used for the synthesis of the outcomes of the empirical studies about Things in the everyday urban culture (see chapter 4). The vocabulary provides an understanding of Things; their main characteristics and unique capabilities as opposed to humans (section 2.1 and 2.2). The attempt of this review is also to create a fundament for the answer of the second and third research question:

2. How should Things in the city co-perform with a human in a one-on-one interaction?

3. How should a small system (~ 3 objects) of Things operate together in a city environment?

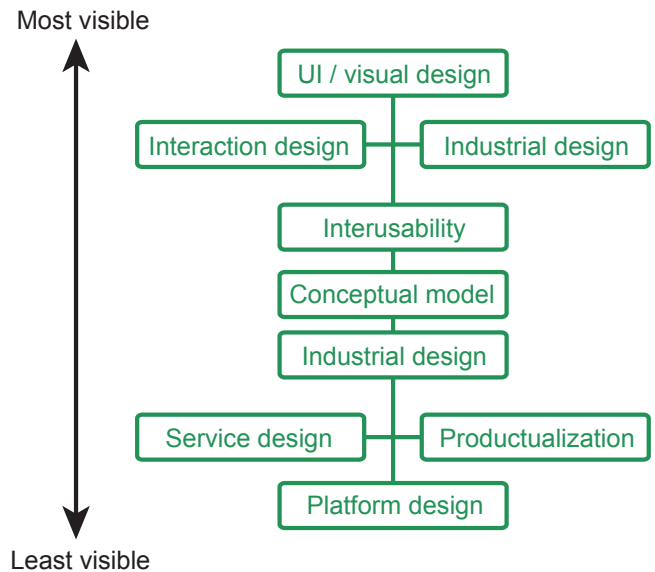
Section 2.3 describes the unique capabilities of an operating Thing ecology as opposed to an individual operating Thing. Section 2.4 summarizes briefly the principles of co-performance from three perspectives: a thing-centered approach, an approach from the aviation industry and an approach from a user-centered perspective regarding a Thing ecology.

2.1 THING CHARACTERISTICS

This section describes a unique perspective for Things and elaborates on the agency aspect. A vision is created on what Things are and what agency is. Finally three forms of agency for Things are presented.

2.1.1 Things as systems

Often, people think about the physical aspect of Things when talking about IoT. Yet, the system behind the physical part of a Thing appears to be more important or of more influential for the user experience than the physical appearance (Rowland et al., 2015). A Thing is not just a physical artefact, it is shaped by the combination between the object and humans and the way they use it (Giaccardi, 2017). The exchange of data and the ecosystem that a Thing is part of gives value to you as a person. A smartwatch for example could be meaningful to a heart patient, as it provides the patient with a right heart rate. Thus, users give meaning to a Thing based upon what it does or how it responds. With their ability to act, Things become actors within the ecosystem including other objects and people; they are part of the whole system around them (Cila et al., 2017). The design of Things is therefore different than for physical artefacts (Rowland et al., 2015). Figure 2.1 shows a representation of the potential different design fields that are involved in the design of Things, from most visible to least visible for users. It shows that a big part of the design aspect of a Thing is not directly visible to the user, such as the service, the interusability (a user interface of a combination of Things), etcetera.



▲ Figure 2.1: Design fields involved in the design of Things.

Conclusion

Rather than the Thing as a physical object itself, it is the system and the input and output streams that are of importance to people and to its purpose, even though this part is less visible to a user. The design of a Thing should therefore focus on the system of a Thing.

2.1.2 Agency

Things have the capacity to sense and to act autonomously. With this capacity Things expose a certain behavior and have an influence on our lives. The products can learn and evolve, reveal new patterns and change our minds. Things can therefore be seen as socio-material assemblies; they are actants with performative roles (Cila et al., 2017). For that reason, it is important to consider how these Things can become part of our culture and society. Cila et al. (2017) envision Things as agents to unravel the ecologies between Things and users. Agency is introduced as a generative metaphor: a framework in order to systematically compare and abstract the use and impact of Things. Within this framework, humans and nonhumans are both capable of acting on and impacting each other. Agency can be seen as something that occurs instead of something that one has. The agency is thus distributed among all actors. Instead of Human-computer interaction, Human-computer integration is introduced: a co-dependent partnership.

Three forms of agency

Cila et al. (2017) present three different ways that Things can display autonomy according to the current IoT developments: the Collector, the Actor and the Creator. These forms compose a scale for the amount of agency: from less (Collector) to more agency (Creator). Note that for this research, the Actor type is

chosen as a focus. The other two types are described to understand the idea of agency for Things, but are out of scope for the project. The three forms are shortly described here.

The Collector

The collector helps humans to reveal invisible patterns of humans' behavior and webs of practices. They help humans to see what was previously invisible; they serve as 'co-ethnographers'. As data readers, they sense and process information. Often Collectors have a dual identity: a physical form and a virtual existence.

The Actor

The Actor has the capacity to sense and collect data, but is also capable of responding to it. As a result Actors will expose certain product behavior, which is formed by its designer. In the interaction between an Actor and a human both delegate action to each other; the use of Actor products requires coordination and negotiation. During this interaction, the user will perceive the Actor's behavior and at the same time an Actor interprets the user behavior as well. The Actor behavior tends to trigger myth-making tendencies of people: product behavior seems to mimic sentience and a certain identity.

The Creator

The Creator is drawn from near future scenarios. This form of agency has the capacity to learn and evolve and to reach towards a certain form of self-awareness. This new form of agency will affect the user's authority and even change the nature of the design process. A self-deciding and self-learning Thing creates a tension between control and agency. This type of Things needs to be designed such that they make choices and take actions that yield to satisfying outcomes.

Conclusion

Things have an influence on their environment and on our lives; they can be viewed as performers within the ecologies of humans and Things. The metaphor agency is introduced as a framework to unravel these ecologies. By this means, humans and Things form a co-dependent partnership. There are three different forms of agency based upon the current IoT developments: the Collector, the Actor and the Creator.

2.2 THING CAPABILITIES

This section describes the two main unique capabilities of Things, their perception and their decision making capability. Firstly, context is introduced as the factor that Things and humans differ in. Subsequently, the differences between the capabilities of the Thing and humans are described in order to understand the Thing capabilities better.

2.2.1 Context

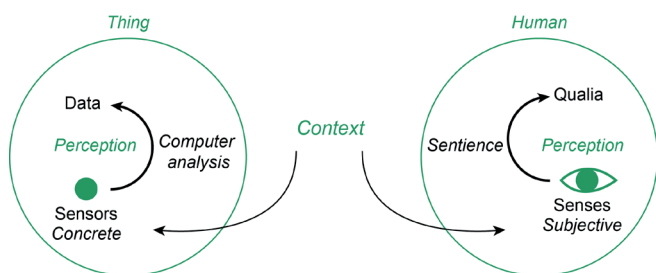
Often, when one thinks of an interaction situation between humans and Things, we have a stereotype context in mind: a human sitting behind a desk computer. This stereotype context was appropriate during the era of personal computer desks and wired devices, however with the newest developments this stereotype context is all but the truth. Humans and Things can interact anywhere, and in unfamiliar contexts, e.g. Things and humans can interact outdoors during unexpected weather conditions. Nowadays, people are interacting with multiple Things in different places at different times. The diversity of contexts is growing and the stereotype context cannot do justice anymore (Bowles, 2013). Our imagination of context is most of the times limited by the location of the interaction. Nonetheless, context is multifaceted: it includes multiple elements that each influence each other as well (Bowles, 2013). A brief overview of these elements is outlined here, based upon the context factors of Bowles (2013), serving as guidelines for the understanding of the broad range of context.

1. **Interface context:** this context is about the capabilities of a Thing and the type of interactions that are enabled for communication.
2. **Environmental context:** this context includes aspects such as weather conditions, sounds, etcetera. Often outdoor environments are more diverse than indoor environments.
3. **Time context:** this context is about the time of use and the frequency. The patterns of use might be relevant as well.
4. **Activity context:** this context covers the intention of the user and how it is related to other activities. It includes whether both user and Thing are involved actively or more passively. Moreover, Things can have an influence on other activities in the everyday life.
5. **Individual context** this context combines the mental attitude and emotional state that a user brings to the interaction and the user's preferences. How can a Thing tailor its behavior and capabilities?
6. **Location context** This context involves the location of use and location-specific needs of users.
7. **Social context** This context covers the appropriate behavior of the Thing regarding the social context, e.g. the difference between a private and public context. The interaction might involve other humans as well.

2.2.2 Perception

Things interpret their context based upon the data that they can collect. They measure their environment with sensors, which leads to concrete end results. These data measurements leads to the way that Things perceive the world. Based upon the perception, Things can conclude themselves what the context is and what the correlation is. The chances

are high that there is causality between the way that the Thing perceives the world and the way that humans do. Humans perceive the world by their five senses and have the ability of sentience. Sentience means that we have qualia, the ability to feel, perceive and experience our environment subjectively. We for example have the ability to feel pain and to suffer (Tye, 1997). Sensors are limited to measuring and to provide concrete data of the environment, which means that they can only detect changes in the state of a certain physical property, such as temperature (Electronic Tutorials, 2017). As a consequence, Things have other assumptions of the world around them than humans do (see figure 2.2). Both could perceive phenomena that the other one is not able to notice.



▲ Figure 2.2: Data-implied versus qualia-implied perception.

Conclusion

The perception between Things and humans is notoriously different and may lead to other interpretations of the context that they are part of. The difference is that Things senses are concrete and human senses are subjective.

2.2.3 Decision making

It is proven that AI algorithms are capable of outperforming us in many specific domains. One algorithm that has proven this statement is Deep Blue, an algorithm that was capable of winning from Kasparov during a world chess championship (see figure 2.3).



▲ Figure 2.3: Deep Blue winning the world chess championship.

Looking at it from this perspective, one could state that AI algorithms are evenly or more intelligent than humans. However, there is an almost universal agreement among AI professionals that AI falls short of human intelligent capabilities in some critical sense: humans are capable of learning and doing thousands of things, whereas Deep Blue may have

become the world champion of chess but it is not able to drive a car or write a scientific paper. This paragraph introduces the differences between the human brain and an AI algorithm and how this influences the differences in decision making (or learning) as a result.

The main differences between the human mind and an AI algorithm

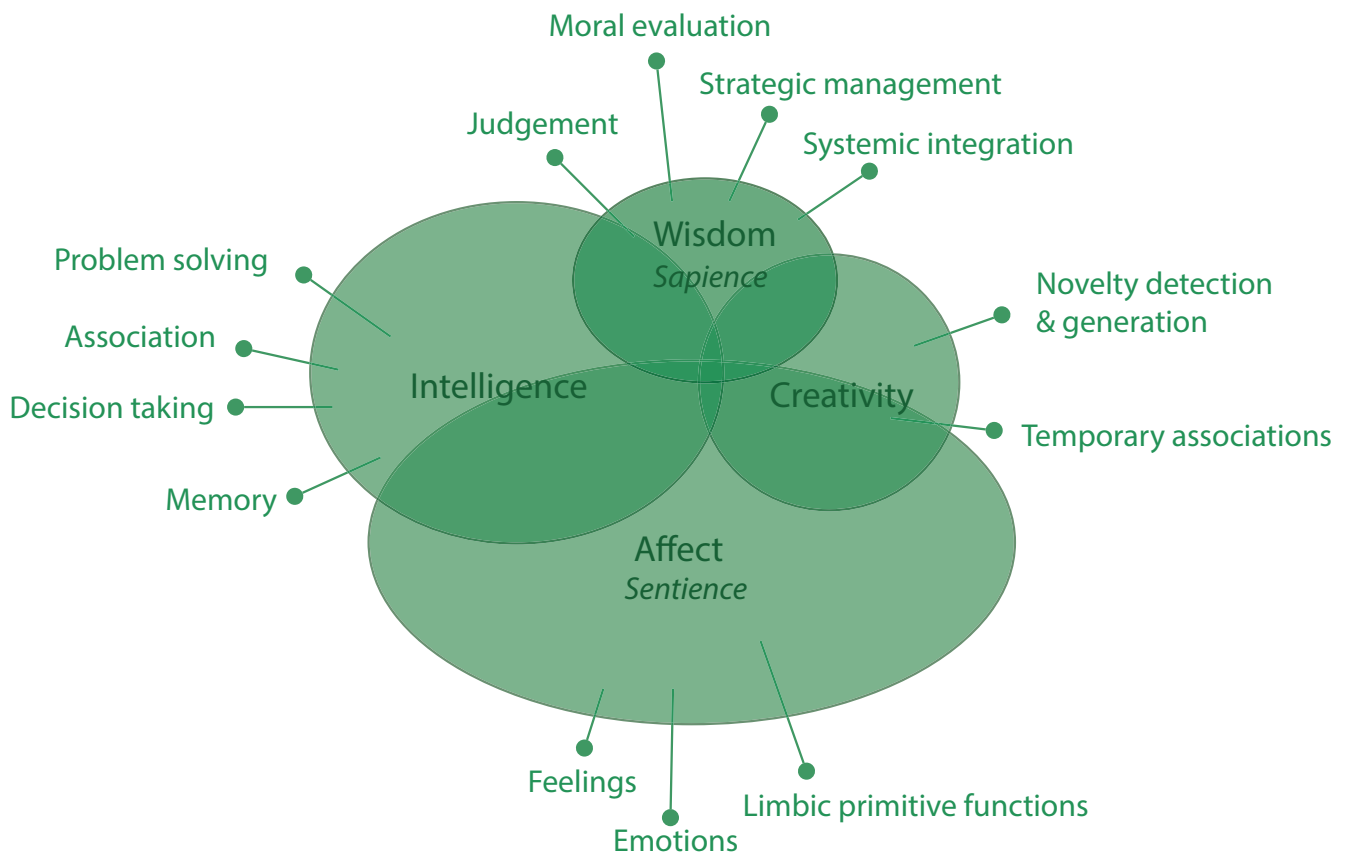
When designing a toaster, designers envision specific events that could occur inside it: envisioning the bread and the reaction of the bread to the toaster's heating element. The toaster itself does not know that its purpose is to make toast – the purpose of the toaster is envisioned in the designer's mind, but not explicitly represented in the computations inside the toaster. As such, if one was to place a textile product in the toaster, it may catch fire, as the design executes an unenvisioned context with a unenvisioned side effect.

The same goes for the design of AI algorithms. In order to beat the best human chess player on the world, the programmers had to develop an intelligent form that played chess better than the programmers did. Developing all possibilities of chess tasks would be impossible. Therefore, the programmers necessarily sacrificed their ability to predict Deep Blue's local specific game behavior, their prediction of distant consequences was not enough to foresee what Deep Blue would do.

What can be concluded from this context is that products and AIs have something in common: they both don't have self-awareness (Bostrom & Yudkowsky, 2011). Self-awareness, to be aware that one is aware, is an (almost) unique capability of humans and is often related to sapience, also called higher intelligence.

Sapience is a unique construct of the human mind. Beside sapience, the human brain consists of a form of intelligence, creativity and sentience (see figure 2.4). Sapience and sentience are closely related; in decision making they are often combined and used as an additional input for decision making (Mobus, 2013). In the construct of Sapience, humans have the ability of moral evaluation based upon the sentience that they receive. This part enables humans to have empathy and to strive for what is right to do. The sapience part is also closely related to tacit knowledge: unconscious knowledge gained by life experience and closely related to sentience. It gives us the ability to judge, which can also be understood as the ability to follow one's intuition (Mobus, 2013). Sapience is therefore also called wisdom.

In AI algorithms, researchers successfully developed the Intelligence part of the brain. They have successfully created memory, the capability of association and decision taking and the ability to solve problems. Current developments are focussed on the capacity of creativity, the main challenge is to reach creativity with desirable outcomes (IBM, 2017). Yet, what is still in its infancy is the construction of sentience and, even more complicated, sapience.



▲ Figure 2.4: These are the four major constructs to the human mind. The relative sizes present how much each construct dominates human mentation (Mobus, 2013).

By this means, algorithms are no reason-responsive agents. When algorithms will be given the ability to operate at many novel contexts, their behavior can seem very unpredictable or even untrustworthy by humans as AI's fall short to predict what the consequences of their actions are to a certain extent. Yet, still one can wonder how AI's can outsmart humans and how they still seem to be so much more intelligent in some kind of way.

Differences in decision making

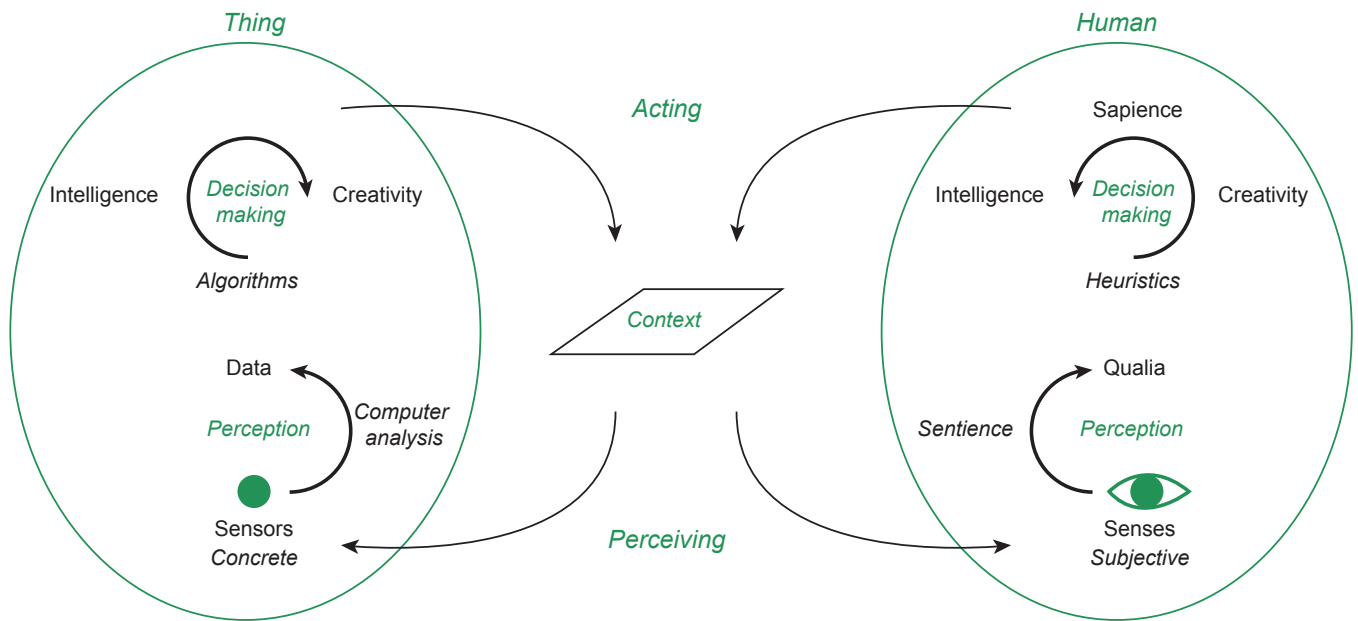
Besides the previously described differences between the human mind and an AI, another difference is how humans and machines make decisions. The human mind mostly decides or thinks with heuristic associations in the unconscious mind, e.g. "if it walks like a duck and quacks like a duck, it must be a duck" (Mobus, 2013). These thoughts are called intuitions, or judgements that guide decision making. A heuristic is an approach that applies a practical method: not guaranteed to be optimal, but sufficient for immediate goals.

Another form of thinking that humans apply in the conscious mind is called logical reasoning, or 'tight' heuristics. Logical reasoning means that the mind applies certain rules to detect patterns to declare the thoughts gained by the previous heuristic thinking process (Mobus, 2013). Though it may be called logical reasoning, it is highly prone

to many kinds of errors; it is not merely constrained to true priori or valid rules. For an AI, it is different. AI decisions are based upon the algorithm method: an effective method to calculate the most optimal result by means of calculation, data processing and automated reasoning tasks (Avdalayan, 2017). It means that an AI is capable of optimal decision making with limited errors for this capability, which could outperform humans during tasks where logical reasoning is required. Yet, logical reasoning of an AI is based on pattern recognition and has its limits therefore. A weakness of AI logical reasoning is overgeneralization; associations are made too fast and may result in wrong discriminations (Bishop, 2006). This happens when the context of a situation is more complex and diverse than the algorithm and its variables. Here, an AI falls short and the human mind has an advantage. Thus, both types of decision making have their own strengths and weaknesses.

Conclusion

Things have another system of decision making compared to humans. They do not have the ability of creativity, sentience and sapience and have another way of decision making. Hence, they make different decisions that may not match to what humans would decide. An overview of the differences between Things and humans in decision making and perception is shown in figure 2.5.



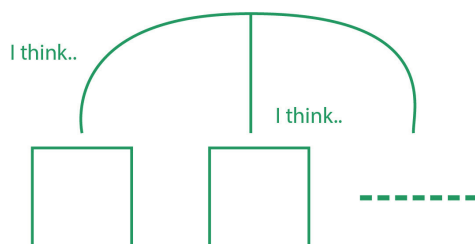
▲ Figure 2.5: The two different approaches of Things and humans for perceiving, deciding and acting upon a situation in a certain context.

2.3 THING ECOLOGIES

A Thing ecology is a combination of different Things with different capabilities that are seamlessly integrated; together they form a single meta-device. Thing ecologies have unique capabilities as opposed to the capabilities of an individual Thing. This section explores these unique capabilities, perception and action, and forms an understanding of how Thing ecologies can contribute more than only being an exchange network for data.

2.3.1 Deconstruction of perception

Imagine a Thing ecology in which Things start to share results based upon their own perception of a certain context. What if Things would decide together based upon shared perceptions of what is happening around them (figure 2.6)? It means that these Things need to rely on each others findings and that they are limited by these findings to draw conclusions of what is happening around them. The project "Affective Things" demonstrates this type of ecology in an ironic way in a small story, during which everyday Things communicate with each other in a home and try to rationalise based upon each other's data what is happening around them (Giaccardi & Nicenboim, 2017).



▲ Figure 2.6: Things rationalising together.

One of the scenarios is a spoon, a tissue box and radio communicating (figure 2.7). Initially, the spoon and the tissue box discuss what is happening based on their measurements. The spoon knows that it is used for ice cream and the tissue box notices that tissues are taken away and thinks it is used for tears. Together they decide on the highest change of what is happening, which turned out to be the person having a heartbreak because of the combination of ice cream and tears. The tissue box consults the radio and the radio decides to put on some sad music. Meanwhile in the real world, the human just spilled some ice cream on his shirt and turns the sad music into cheerful music, which means the Things were all wrong with their collected assumptions about what the human was experiencing.

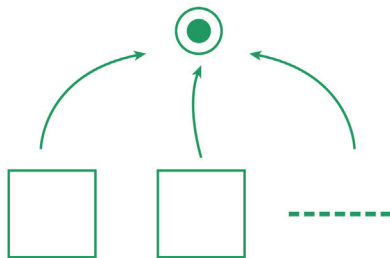


▲ Figure 2.7: The story of Affective Things (Giaccardi & Nicenboim, 2017).

2.3.2 Deconstruction of action

Why would a Thing have all capabilities by itself to perform tasks if it can connect easily with another Thing to act together? A system of Things with a division of tasks is the deconstruction of one Thing's action into more Things doing smaller actions. This

is called a swarm (figure 2.8). Within a swarm, each single Thing works largely independently, but follows a set of simple rules. Simple Things that cooperate loosely are ideal for a goal that requires repetition of simple tasks (Verhoeven, 2016). The advantage of deconstruction is that if a part would fail, the others could take over. Since there is no central authority, Things need to make decisions based on what they see others doing and what they observe in their immediate environment. It can only succeed if the rules allow flexibility in their behavior. The collective outcome of individual behaviors is unpredictable. Studies are conducted on the ways that swarms do collective decision-making, how they communicate their choices and how individual decisions may add up (Verhoeven, 2016). Swarmanoid is a famous concept for a swarm performing a task together. Mauro Birattari is a well known researcher on swarmanoids and developed a story for a movie about a swarmanoid working together to pick up a book from a shelf (Birattari, 2011).



▲ *Figure 2.8: Things acting together towards a shared goal.*

Robots act together to get a book from a bookshelf. Different robots are placed in different room, so communication is needed in every room and in between the rooms. There are a few helicopter robots attached to the ceiling that communicate to the robots what is happening in general. There are a few robots that can grab and climb. The other robots can move and are the legs of the grab robot. Together the leg robots move one grab robot, with coordination information from the helicopter robots, to the bookshelf (figure 2.9). There, the grab robot starts to climb, takes the book and climbs down. From there, the leg robots take over and bring the grab robot to the other room, where other leg robots are standing with another grab robot to take over. From there the book is brought to the starting point with the help from the helicopter robots.



▲ *Figure 2.9: The legs and grab robots of the Swarmanoid.*

2.3.3 Conclusion

Thing ecologies have more unique capabilities compared to a single Thing than only sharing data to each other or humans. They could draw conclusions together based upon their perceptions or act together based upon each having simple tasks. This deconstruction of perception or action lead to a new understanding of Things being able to co-perform around us without our input.

2.4 CO-PERFORMANCE

Previous sections have described the unique characteristics and capabilities of Things and Thing ecologies. With these definitions in mind, the co-performance between Things and humans can be illustrated. This section provides an understanding of co-performance and guidelines for the design of it. The guidelines are found through three research questions that are answered in each paragraph of this section:

Paragraph 2.4.1 What are the principles for co-performance itself between Things and humans? (based on research question 2)

Paragraph 2.4.2 What are the guidelines for the interaction between Thing ecologies and humans? (based on research questions 2 and 3)

Paragraph 2.4.3: What role do designers, Things and users play in the notion of co-performance in the everyday life? (based on research question 2)

2.4.1 The principles for co-performance between humans and Things

Klien et al. (2004) present the guidelines for the co-performance between humans and non-human agents in the aviation industry by portraying automation as a 'teampayer' in joint practices. According to Klien et al. (2004) it is necessary that humans and non-human agents go into an agreement in order to reach the goal of a joint practice and to collaborate as team players. Their reasoning is that, naturally, humans go into an agreement as well; humans agree - often in a tacit manner - to facilitate team coordination during joint activity in order to work towards a shared goal. The following four main requirements summarize what an agreement should look like and what the necessary communication elements are for both humans and Things. Both humans and Things are hereby regarded as agents.

1. The agreement between agents

The first principle for an agreement is that it involves goal alignment, in order for parties to commit to the agreement. Typically, it means that one or more agents need(s) to relax their own shorter-term goals in order to permit the long-term team goals to be addressed. It is important to note here that the agreement is not a once-and-for-all one, but rather one that is continuously renewed and improved. It includes the expectation that committed agents

will replace faulty mutual knowledge, beliefs and assumptions that are detected.

Hereby, agents should be aware of actions that enhance the compact's integrity as well as that they are aware of the factors that could degrade it. For example, in a conversation it is about the process of accepting turns, relating understandings, showing interest, and so on. If an agent fails in this part, it seems like that agent is not wholeheartedly engaged. As such, if an agent intends to drop out, the agreement should require that this agent sends a signal to the other agents.

Agents should keep involved and invest for coordination, while simultaneously agents must strive to keep the costs of investment down. Partly this can be solved by good human-computer interface design. Moreover, Things must conform to human's needs rather than requiring that a human needs to adapt to them. In order to do so, Things must become understandable, predictable and sensitive to people's needs and knowledge.

2. Agents have mutual predictability in actions

In highly interdependent activities, planning one's own actions is only possible when we can accurately predict what others will do. Agents should be equally predictable. In order for Things to become more predictable, they should reveal their status and intentions in an obvious way, such as their targets, states, capacities, intentions, changes and upcoming actions. Humans can often use their own thought processes for inferring the way their teammates are thinking, but this is not effective in working with Things. A Thing's intelligence might work against the confidence that humans have in their predictability. The more intelligent, and simultaneously the less transparent, a Thing becomes, the harder we find it to confide tasks to it. Mutual predictability is for this reason important as well.

3. Directability towards other agents

All agents must be directable, which means that they have the capacity to modify and balance other agents' actions in a joint activity as conditions and priorities change. This directability can be achieved by Things by introducing policies that dynamically regulate a system's behavior without changing the 'code'. Humans can express precise bounds on autonomous behavior through policy in a way that is consistent with their appraisal of a Thing's competence in a given context. This way the actions also become more predictable.

4. Maintaining common ground during joint activity

Common ground enables all agents to comprehend messages and signals to coordinate joint actions. It includes the knowledge, beliefs and assumptions that the agents share. This means that agents must be able to adequately model the other participants' intention and actions. This is where a team of 'only Things falls short, as it is hard to maintain a shared goal when unanticipated problems arise.

The ability of sending signals is not enough, Things that receive signals should also be able to interpret them and form models of their teammates, the controlled process and its environment. It is acknowledged that there will always be asymmetry in coordinative competencies between humans and Things which will always create difficulties for the design of human-Thing activities.

In order to succeed in common ground, team members must know by their own mental models when it is time to inform another member. This should be done in an intelligent and context-sensitive manner. An agent should signal if it has having trouble, is taking an extreme action or moving towards the extreme end of its range of authority. This is often done by threshold-crossing alarms, that go off when a certain limit is exceeded or reached. Yet this is not desirable as it is very context-sensitive and often leads to the agent alarming too early or too late.

2.4.2 Principles for the interaction between Thing ecologies and humans

Based upon the form and affordances, humans can collaborate with different Things depending on the task and context of use, e.g. we specifically use a smartwatch to track our health. We can use multiple Things at once for activities as the sharing of content, e.g. with Google Drive we can open up our own cloud on our phone as well as our computer at the same time. Combining different Things to achieve a shared goal is called cross-device interaction. Human-computer interaction is hereby moving from interaction with an individual Thing to an ecology of Things. These Things can be combined by a seamless cross-device interaction that acts as a single meta-device, Houben et al. (2017). Even though it seems as a logical transition, the shift towards cross-device interaction brings many challenges. Things are still essentially designed for isolated personal use and there is a lack of research on many aspects of it. Houben et al. (2017) and Rowland et al. (2015) introduce four relevant principles for the design of a seamless cross-device interaction. These four principles are described below.

1. Easy configuration of Thing ecologies

The first priority for creating a Thing ecology is to enable humans to easily combine, pair, attach and stack Things to create a shared input and output space into one seamless meta-device. This includes thinking about a discovery mechanism for usable Things in the environment, a control mechanism for users to contribute or withdraw a Thing from the ecology and transparency for the user about the functions that Things are providing and sharing.

2. Interaction attributes for cross-device interaction

It should be clear to users what the content, action possibilities and capabilities are across the different heterogenous Things. This includes the abilities for

users to discover the functionalities and the feedback, and knowing how and via which Thing one can bring input and receive output. It is also important to consider how humans can correct a potential mistake.

3. Choice for contribution

Humans need the ability to define boundaries between personal user space and semi-public content and information. They should also be able to opt in or opt out the Thing ecology setups depending on the context of use. It is important to also give users some level of control on how their Things are tracked.

4. Consistency in design

The core challenge to achieve the principles above is to create consistency in the elements, so humans can create an understanding of the overall system in order to understand the interrelationships between the Things (Rowland et al., 2015). Functionality should be distributed between the Things, to suit the capabilities of each Thing in their context of use. Even though this may be common sense, in practice dividing functionality for the context of use turns out to be more difficult than expected.

2.4.3 The principles for co-performance in the everyday life

As described in chapter 1, humans have socially shared, materially embedded ideas of how to appropriately perform a social practice. Hereby, a performance represents a situated interpretation of what appropriate performance is (Kuijer & Giaccardi, 2017). As situated circumstances vary and change over time, a situated performance may result in a reinterpretation of appropriate performance. When Things become part of a social practice, the appropriateness of a performance may change. From now on social practice will be co-shaped by humans and Things. Yet, what is appropriate is in the messiness of the urban culture not always straightforward. Therefore, some assumptions on appropriate behavior need to be embodied in the Thing itself by a designer, shaping the capabilities of a Thing during practice. The crux is hereby that practice itself reshapes the suit of capabilities of its performance; what is envisioned by a designer as appropriate may not be up to date with the perception of users. Therefore, Kuier & Giaccardi (2017) introduce three principles for the design of co-performance in the everyday life. These principles are as follows.

1. Co-performance as a framework for design

The notion of co-performance should be used during the design of Things as a framework for realising appropriate performances. By this means, a designer should strive for the integration of different capabilities, uniquely for humans and uniquely for Things, into appropriate roles and performances.

2. Open space for the behavior of a Thing

It should be clear to the designer that there is a designing iteration circle between the professional design and the everyday use practice. Performances of Things should not solely be determined by decisions made in the design process. Instead, the designer should create an open space for the behavior of a Thing in order to let a Thing adapt to the appropriate performances as according to the user.

3. Promotion of both Thing and human capabilities

The design of a Thing should promote the ethics of co-performance. Humans should not be treated by a Thing as machine-like and Things should not be designed as if they are human-like in order to prevent unrealistic expectations. Things should be acknowledged as a category in their own right and not as poor imitations of a human.

2.4.4 Conclusion

The design of Things and Thing ecologies involves many design principles in order to achieve appropriate co-performance between Things and humans. The first group of design principles are based on the belief that humans and Things should be able to operate as team members and should therefore be part of an agreement that strives for a shared goal. In order to do so, humans and Things should be equally predictable, directable and they should keep common ground. The challenge is hereby that both have an idea and accurate prediction of what the others are doing or will do. The second group of design principles are generated in order to create a more seamless interaction between a Thing ecology and human. The aim of these design principles is to make the Thing ecology as understandable and logical as possible for humans. The challenge hereby is to enable users to create a mental map that involves an idea of the capabilities and functionalities of each Thing and the collaboration between the Things. This could best be achieved by applying similar characteristics in the system and interface of each Thing. The third set of design principles is more practice-oriented and is based on the changing interpretation of appropriate behavior over time by users. In order to design for appropriate behavior, designers must acknowledge the gap between the perception of a designer and of a user about appropriate behavior. Moreover, designers should design Things that promote the unique qualities of humans and Things according to the notion of co-performance.

3. A CIVIC MODEL FOR DEMOCRATIC CITIZENSHIP

This graduation research focuses on the co-performance between Things and citizens in the everyday urban culture. As introduced before, empirical research is conducted to discover values of public behavior (chapter 4). The results of this empirical research show a relation between these values of public behavior and the grounds of democracy. A small literature study is conducted to discover what democratic citizenship means. As a result, the 12 tables of civism model of Butts (1988) is chosen as a representation of the democratic values for citizenship (see figure 3.1). This model is chosen for the following reasons:

1. Civism is a traditional word for “the principles of good citizenship”. The twelve tables of civism is thus a representation of the way that citizens should behave according to the principles of democracy. This model fits into the scope of this project.
2. The twelve tables of civism is a model for the fundamentals of a democratic society. It can be argued that each western nation has a different interpretation about democracy; however the values in this model are abstract and reflect the basic understanding of western democracy in general. This statement is validated by two empirical studies (section 4.1 and 4.2).
3. During the session of the first research (chapter 4.1), participants perceived gains and needs to be the first quality of citizens. Gains and needs are also integrated in this model as a standpoint, by means of obligations that bind people as political community and rights to assert democratic polity.

Each table in the model stands for a theme that exhibits a set of democratic values in a compact form. At the top of the model are the fundamental themes and towards the bottom are the more specific themes based upon the ones above. The tables are not discrete or mutually exclusive; they conflict with each other and can be interpreted in many different ways. This model provides thus guidelines rather than a solid description, in order to understand the fundamental democratic principles of citizenship in western societies. The last two tables, patriotism and human rights, will be neglected, as this project is focused on a city level instead of a national level. Each table is briefly explained below.

Justice

Within the model, Justice is seen as the moral basis of a democratic society. The basic idea of justice (what is right) is present in most social contacts (from individual friendships to the relation between citizens and the government). A public sense of Justice creates a well-ordered society in which everyone accepts the same principles of what is right; and knows that others do too. Justice establishes the claim of what's right prior to what's good, since what's good can be defined differently by individuals and

groups based upon personal desires. Therefore, it puts limits and imposes restrictions on what may be reasonable conceptions of one's own good.

Freedom

The first priority of bringing justice into practice is equal basic liberties. Therefore the democratic society will be committed to the idea of freedom as well as equality. Freedom protects citizens from abuse of their liberties by others or the government. The three following types of liberty are relevant to citizenship:

- Freedom of person and private action: to live one's own life in dignity and security and to pursue self-fulfilment without irrational constraint by others
- Freedom of the mind and intellectual inquiry
- Freedom of the citizen and of public action: the ability to take active part in shaping institutions and laws with others to promote a democratic society for others

These civic elements create a tension between public and private freedoms. An individual's right to equal liberties should not restrain the system of equal liberties for all.

Equality

In this context of citizenship, equality means that all individuals having equal rights and equal opportunities in a democratic society. Social and economic inequalities need to be arranged with the result that both are to the greatest benefit of the least advantaged and that it enables conditions of fair equality of opportunity for open positions and offices. Equality does not imply the 'equal protection of laws', as without guardianship it would result in majorities forcing their views onto the whole society.

Diversity

The diversity of a society should be embraced in order to create a society in which justice, freedom and equality take part. The challenge is to find a balance in creating a unity in order to be an equal society and to stimulate diversity in order to respect one's freedom. According to (...), the most optimal way to find a balance can be reached by pluralism: the maintenance of ethnic boundaries in the goal to hold to small communities of the past based on the equality of groups.

Authority

Authority in a democratic polity is the established right to act as a leader by exercise of influence and command within the confines of rules by the consent of the governed. The accent is primarily on right and not on power. The exercise of democratic authority should be constrained by the values of justice as well as functioning to insure the freedom and equal opportunity for individuals. Trustworthiness and responsibilities are values that leaders should possess in order to succeed as being part of democratic authority.

Privacy

Privacy is one of the basic values of pluralism along with freedom, diversity and due process. Privacy is the right of individuals and groups to be left alone and to determine for themselves what information about themselves or their actions is communicated to others. The essence of the right to privacy for individuals includes an understanding of the obligation of government and citizens to obey the law. Therefore, authority is only able to invade privacy of individuals if it has 'reasonable grounds' for expecting the provision of evidence of individuals breaking the law.

Due process

Due process has to do with the rights of persons who have been accused of wrongs or injuries they have committed. It values the presumption of an accused person's innocence and their protection of individual rights in criminal cases.

Property

The emphasis of property is on the rights and responsibilities of ownership of property in a democratic society. It includes the intangible property, such as ideas, benefits or labor. It is a complex value that invites for a conflict with liberty: the government has to protect one's individual property on one hand and to enable equality in welfare and other factors on the other hand.

Participation

Fundamental to the success of a free society is citizen participation in the political process. Participation by citizens is a natural action, it emerges even if it is not encouraged by the government; in that case it will be practiced by citizens by means of mass demonstrations, freedom rides and civil disobedience. Yet 'direct participation' by citizens is

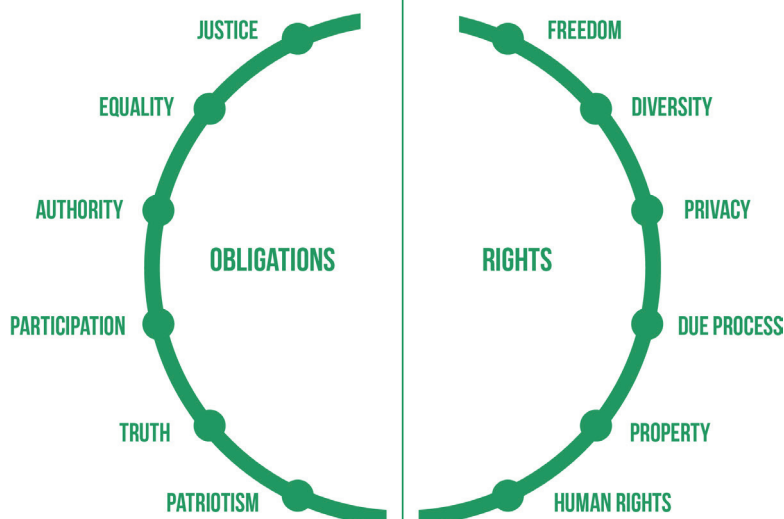
not the desired solution for the following reasons: first, direct participation can be manipulated by special interests or selfish purposes and private pressure can be put on legislators which causes unbalanced lobbying, second because democracy is meaningless if there is no responsible majority that is given power to govern. A participatory model in which citizens participate on a 'micro' level will likely result in small participatory groups whereby citizens only participate with others who are like-minded of concern for common good. The potency of citizen participation lies in the capacity for reinforcing and balancing the influence of citizens and government at the same time.

Truth

It is crucial for an individual to be able to distinguish the truth from the likely falsehood or half-truth if he wants to survive. Truth can be seen in many ways for example:

1. The truth of thought consists in the correspondence between what one thinks or believes and what actually exists or does not in reality.
2. The truth of speech is the correspondence between what one says to another and what one thinks to oneself.

The public aspects of truth-telling are important when it comes to the security of a free society. The only real safety can be guaranteed if knowledge is free and available to people who have the right and will to use it wisely. This is of importance as freedom of the mind is a foundation for all other freedoms. Hereby the reliability and the validity of public knowledge becomes the most important. It has to do with the rights and responsibilities of citizens in telling the truth to one another and the role of the government in revealing or hiding the truth from its citizens.



▲ Figure 3.1: The democratic citizenship model (Butts, 1988).

4. PUBLIC BEHAVIOR IN THE CITY

As mentioned in section 1.1, Things need to adapt to the urban culture and show appropriate behavior if they will execute social practices beside citizens. The empirical research of this graduation project starts with an investigation on citizen's qualities and on appropriate behavior in the public urban environment according to society. The first research question, "What requires a Thing to be a citizen?", will be answered in the following studies to discover whether Things need to exhibit these qualities and whether they need to expose a certain behavior in order to fit into the urban culture. For each study, the results are compared to the tables of the democratic citizenship

model that is presented in chapter 3.

The studies are all conducted with Dutch participants and the results are therefore only applicable for Dutch society unless further research proves different. For each piece of research, experts on Industrial Design or on the Internet of Things are chosen as a focus group. The reason is that these focus groups have the ability to imagine what a Thing could do; earlier research with a random selection of citizens had proven that people with no knowledge of the Internet of Things could not imagine or understand what a Thing could do.



4.1 CITIZEN QUALITIES AND PUBLIC BEHAVIOR

4.1.1 OBJECTIVE

The aim of this study is to discover what citizenship means according to Dutch people and how it is expressed in certain qualities. Moreover, the intention is to discover what desired and undesired public behavior means in the city. Finally, the aim is to explore if there are relations between the different citizen qualities and between the different behavioral values.

4.1.2 METHOD

Participants

Five Master students from the TU Delft are selected for the session, each with a different specialisation. All students have a background or currently study at Industrial Design Engineering. Among is one international student, living for two years in the Netherlands and originally from Finland.

Structure

During the first part of the creative session, the participants brainstorm about the definition of a citizen and its qualities. After this first part of the session, participants continue brainstorming about the desired behavior of a citizen and the undesired behavior. During the three brainstorms, participants discuss together and write down their subjects on post-its. Pictures of places in a city are shown that can serve as an inspiration.

Measuring

The session is video and audio recorded. Notes are made during the session and the developed material is studied to compare it with what is said by participants during the discussion.

4.1.3 RESULTS

During the brainstorms, the participants discussed several subjects about citizen qualities, desired behavior and undesired behavior (see figure 4.2 for an overview). These subjects naturally appeared during the discussions; they were written down as a topic and collected on a brainstorm paper by the participants. The discussions about these topics are described here per brainstorm.

Citizen qualities

The participants agreed first that citizens have gains and needs. It was seen as a feedback loop; you get something out of citizenship but you also have responsibilities, e.g. you need to behave according to the law or pay taxes. Moreover, they described the contrast of the citizen identity: an identity of

a citizen is shaped by the city identity (you are either Amsterdammer or Rotterdammer) whereas the collective individual citizen identities shape the identity of the whole city. They also discussed unity and diversity in society. Participants called the distinct groups microcosms (bubbles); as an example they took the faculty IDE where there is a culture difference between bachelor and master students. They agreed that the groups will always need things from other groups; at the faculty students go to Sodexo for lunch. A city in general or the bubbles themselves are thus never self-sustaining. They also discussed the scalability of the term citizen: one can be a citizen of a nation, a city or even of a big neighbourhood in a metropolis. They saw two definitions in the term citizen. On one hand it has a social definition: as a citizen you become familiar with the environment and the people around you. On the other hand it has a demographic definition: you are part of a shared space (a city) and you own a certain amount of this space.

Desired behavior

At first, the participants agreed that citizens should obey the rules created by society: "you do not want that others have a problem with you". Yet, citizens should be flexible as well: "it is not always good to stick to the rules". Citizens should be tolerant and solidary in order to create a harmonious society. They should also be trustful and loyal to society. Citizens should for example help directly during incidents: after a car crash, it is needed that bystanders have the intention to help directly. They also mention that citizens should show initiative to fit into society and that they need to show initiative to improve the city using constructive criticism.

Undesired behavior

During this brainstorm, participants viewed undesired behavior mainly in the form of a citizen that is unwilling to follow the responsibilities that they have. They described it as a not in my backyard attitude; a selfish attitude and sole desire to profit from societal benefits. Another form is that a citizen should not be against the system: it is not helpful to rebel against the government but better to stimulate improvement in a constructive way. They also discussed that citizens should not violate someone else's rights or create a chaos in a shared space. Moreover, they discussed the grey area of following rules; citizens should not be too straight forward in following the rules, but should adapt to specific situations.



▲ Figure 4.1: Participants brainstorming and discussing.

CITIZEN QUALITIES

<p>Gains & Needs</p>	<p>Identity creation</p> <p>↓ City identity Top down</p> <p>●</p> <p>↑ Citizen identity Bottom up</p>	<p>Microcosms</p> <p>Not self sustaining</p>	<p>Different scales</p>	<p>Social vs Practical</p> <p>Feeling at home</p> <p>Demographic</p>
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DESIRED BEHAVIOR

<p>Follow the rules</p>	<p>Flexibility</p> <p>Carry on</p>	<p>Caring</p> <p>Solidarity</p> <p>Tolerance</p>	<p>Show initiative</p> <p>For your own</p> <p>For the city</p>	<p>Trustful</p>
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UNDESIRED BEHAVIOR

<p>Being against the system</p>	<p>"Not in my backyard" attitude</p>	<p>Being too straightforward</p>	<p>(Intentional) harm</p>
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▲ Figure 4.2: The topics discussed during the brainstorms

4.1.4 DISCUSSION

The results are compared to the democratic citizenship model (chapter 3). Relations are found between some of the discussed topics of the brainstorm and the tables of the model (see figure 4.3). The relations between these topics and the tables are described in the next three paragraphs.

Citizen qualities compared to the democratic citizenship model

Two of the qualities that the participants discussed match with the model itself or the tables of the model. First, the participants agreed that citizens have gains as well as needs, which compares to the division in the model: obligations and rights. Second, they identified the difference between unity and diversity, two opposite tables in the model.

Desired behavior compared to the democratic citizenship model

Four out of five discussed topics about desired behavior relate to the tables of the model. The first topic can be related to the table authority, as the participants claimed that people need to behave according to the law. Furthermore, the participants also agreed that citizens' should participate in a society, either by contributing to the city development or by being solidary and tolerant to others, which matches with the table participation. The topic trustful can also be related to this table: people must be loyal to the society that they are part of.

Undesired behavior compared to the democratic citizenship model

All discussed topics in the brainstorm about undesired behavior relate to the tables of the model. First, participants agreed that citizens should not rebel against the system; they should act according to the rules of society. This topic matches with the

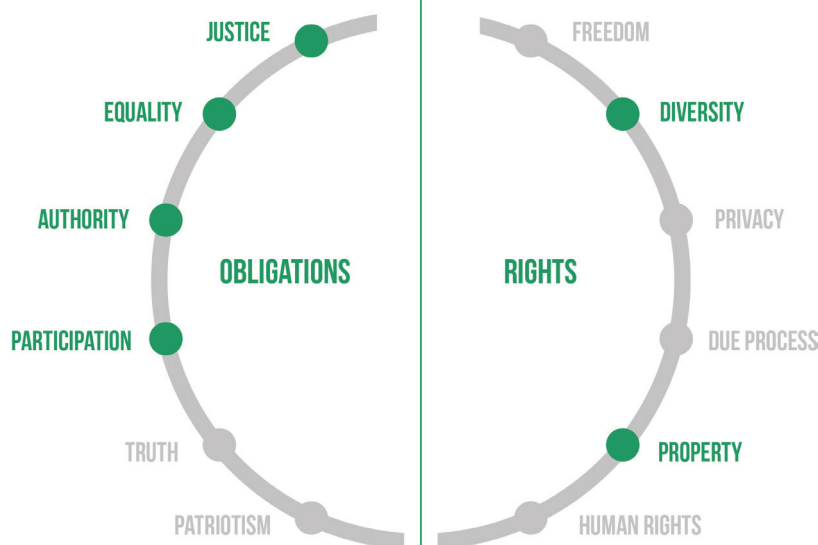
obligations and rights setup of the model. Second, participants agreed that sometimes people also need to help even if they are not directly involved; this can be related to the table unity. The third topic is about justice: people should behave according to shared moral values of what is right instead of solely rules. The fourth topic relates to property; one should not harm other or public property.

Human values

Most values of the discussed desired and undesired behavior seem as a request for citizens to behave humanly: to be solidary, trustful and open to others. These values will not be directly applicable to Things; however they shape the idea of the urban culture: in public we expect everyone to be there for others when they are in need, regardless of who you are. Moreover, we expect other citizens to behave on shared moral values; that they are loyal to society and flexible in situations when the rules might not help to make the right decisions. It is important to note here that Things do not possess the ability, now or in the near future, to behave in a certain flexible way as well (see chapter 2, section 2.2 for more information).

4.1.5 CONCLUSION

The aim of this study was to discover what citizen qualities are and what the values are for public behavior. Analysing the results of the brainstorm introduces the belief that democratic values are the ground for (some of) the public behavioral values and the qualities that citizens ought to exhibit. In order to research this phenomenon further, other studies with different research methods are required. Additionally, research is needed to discover whether these democratic values are also relevant for Things in order for them to be acknowledged as citizens by society.



▲ Figure 4.3: The identified relations between the topics and the tables of the democratic citizenship model.

4.2 BEHAVIORAL VALUES FOR THINGS IN THE CITY

4.2.1 OBJECTIVE

The first aim of this study is to research citizens' values of public behavior more extensively than previous study (section 4.1). The values found in this study will be compared to the democratic citizenship model (chapter 3). The second aim is to discover whether these values also apply to Things in the city and to what extent.

4.2.2 METHOD

Participants

Five citizens from Amsterdam with a technical background and an interest or profession in IoT are selected for this study. The age among the participants varies from 23 to 35 years old.

Structure

The research method Contextmapping is applied for this study. Contrary to interviewing or questionnaires, Contextmapping enables to discover insights about people's unconscious knowledge such as their dreams and fears. Thus, the purpose of Contextmapping in this study is to reveal values about public behavior that citizens might take for granted. The Contextmapping research is divided in two parts. The first part is a home study for participants that they conduct one week in advance. This home study serves as sensitizing material to prepare participants for the second part. The second part is a creative session during which participants discuss three provotypes and participate in an ideation session. As defined in chapter 1, section 1.4 the provotypes are provocative design proposals to challenge assumptions and preconceptions of public behavior and Things. The purpose of the second part is thus to discover what participants' values are and how they would like Things to behave in the city according to these values.

The structure of the session is as follows:

1. Discussing the value circles of the sensitizing booklet

Each participant explains to the others his or her own values for public behavior according to the value circle assignment that they prepared during the home study. This value circle represents what public values are important to a participant and to what extent (the inner circle represents the most important values and the outer circle the less important ones).

2. A discussion about three provotypes

The three provotypes are representations of Things in the city with an anti-social character (see figure 4.7). They will be shown to participants in order to provoke discussion about Things and behavior in the city. The discussion has the form of a semi-structured interview; this semi-structured interview is solely used to stimulate discussion and to steer the discussion if needed. First the provotype is shown with a brief

explanation; participants are free to ask questions about the provotype and to exchange first thoughts. Later, questions are asked to steer the discussion about what participants think and feel while looking at the provotype. The provotypes are placed in order: the first provotype has a normal anti-social character, the second has a highly antisocial character and the third is semi anti-social. This setup is chosen in order to stimulate the thinking process. One participant is summarizing the discussion by writing down the general discussion points on post-its in order to keep track about what is being said.

3 Clustering the opinions and views of the discussion

Together with the participants, the discussion points will be clustered in a few topics. These topics are used for the ideation as they will be reversed into design principles for Things that act according to values for public behavior.

4 Ideation for the design of Things based upon the clustered values

Each participant generates ideas during a brainstorm session whereby they are asked to create better design using the design principles generated in previous phase. The participants receive a card with an object, function and location in order to give them a clear direction for the ideation.

Material

1. Sensitizing booklet

The sensitizing booklet focuses at first on the current experience of participants within the city and their activities in the city. In the next part, participants describe their ideas and expectations about future IoT and human-machine collaboration. The booklet takes max. 50 minutes to fill in and is handed over 1 week in advance. See Appendix 8.1 for an overview of the content of the booklet.

2. provotypes

The provotypes are concepts of anti-social Things in the city to provoke discussion between the participants about the desired behavior of Things in relation to their values. By showing anti-social Things, participants are triggered to talk and discuss, revealing hidden values that we as people would normally take for granted (bron). During the session each provotype is shown for 15 minutes for discussion. The creation process of the Provotypes and the reasoning behind the provotypes is described in Appendix 8.2.

Measuring

The session is video recorded and the discussions with the participants are transcribed in order to compare their discussion with their written content in the booklet and their ideas during the brainstorm session. Results of booklet, discussion and ideation are compared to discover patterns and to draw a conclusion from the collected material. Hereby, the democratic citizenship model (chapter 3) is used to compare the results with the tables of the model.



▲ Figure 4.4: Participants during the discussion about the provotypes.



▲ Figure 4.5: Participants during the ideation phase.

4.2.3 RESULTS

Unique values

The arguments and ideas of each participant in the session matches with the value circle that they created. They had each unique view upon the values for Things in the city during the session. The core value of each participant is summed up in a short overview (figure 4.6).

Life in the city

Within the booklets, life in the city is shown as a very functional one. Participants spend their time in public spaces mostly to get from A to B according to their timeline assignments. Most of their thoughts are about stressful or unexpected events (waiting for the traffic lights, my bike spot is taken). Meanwhile, most participants had the best experiences in the city during a positive interaction with a stranger (a wallet was stolen and brought back, a stranger gives a compliment about the clothes).

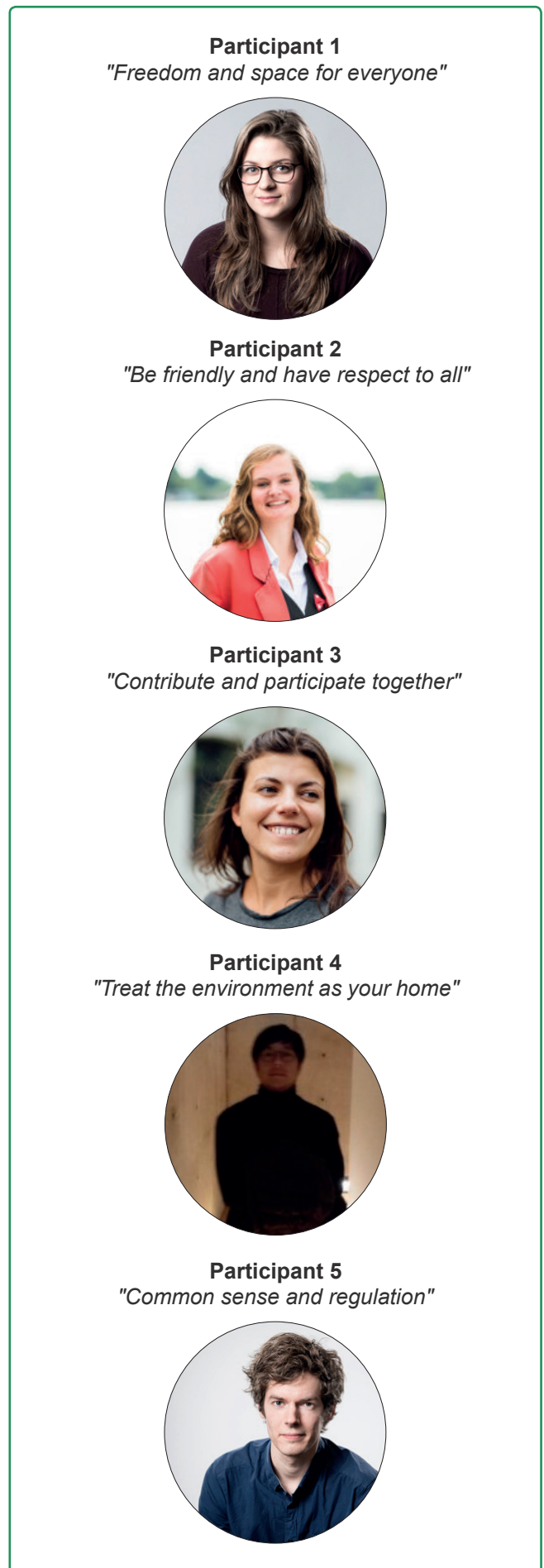
Subjects of the provotype discussion

During the discussions of the provotypes, participants came up with several subjects. The discussions are summarized here, describing the discussed subjects and participants' standpoints. A transcription of the discussions can be found in Appendix 8.3.

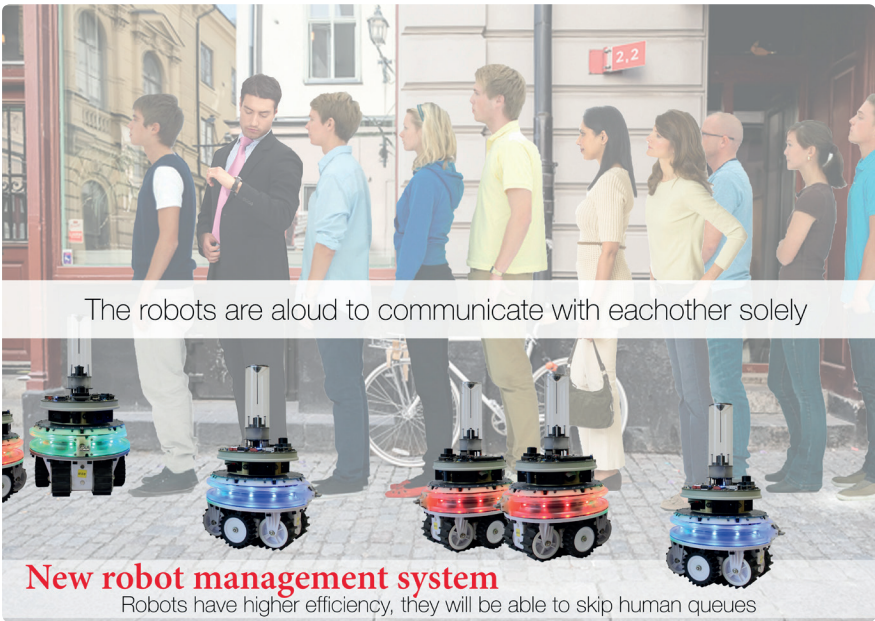
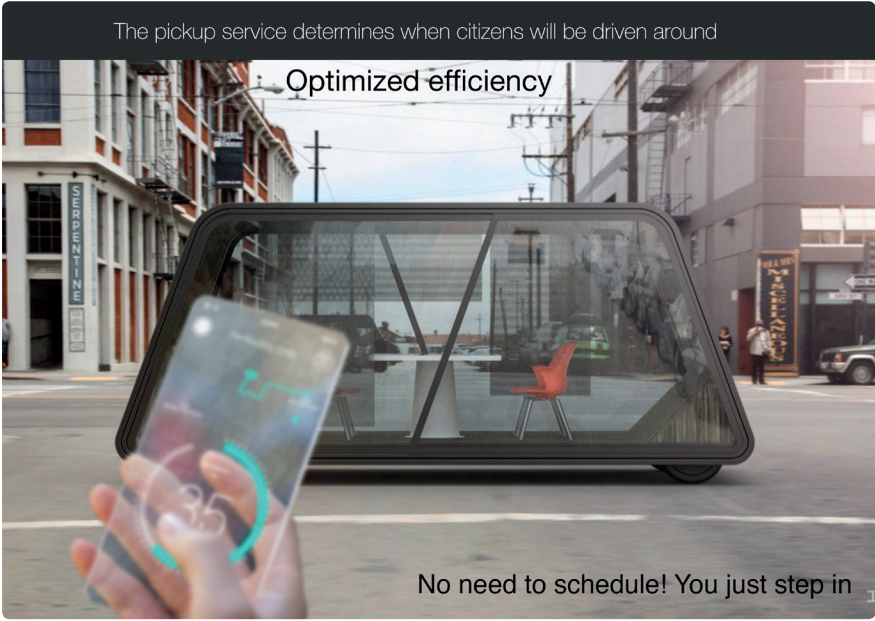
First provotype – power and black box effect

The first provotype represents public transport that does not take into account your schedule as a traveller in the city. The discussion between participants started about the issues of planning around such a means of transport, however it gradually changed into a different discussion about the power of a Thing. Participants did not like the amount of power that this means of transport has, as it determines when you are picked up: "There is something that sounds strange and for me it's exactly that verb: that the pick-up service determines (...) I mean, does it fit with my need?" – Participant 3. To the participants it is important that the Thing serves the needs of humans, and that this should be the end goal: "So also the question, what is more important: the Thing or the person?" – Participant 2.

Participants showed also their concerns of Things with an 'own opinion': "The reason of a Thing should be to help people in an efficient way (...) a Thing is not created to have an opinion." – Participant 5, "I hope that things don't get an opinion" – Participant 1, "If they get an opinion (...) I would like to let them be more friendly than this" - Participant 5. Moreover, they did not like the fact that they could not see why, or based on what, the transport means makes certain decisions; it seemed too mysterious to them: "It looks transparent, but actually.. it is a black box! So I would like to know more" – Participant 3. They would like to have an idea on who is behind it: "what if the Thing has a face?" - Participant 5



▲ Figure 4.6: The participants and their personal values.



▲ Figure 4.7: The three provotypes.

Second provotype – Punishment and public shaming

The second provotype introduces a form of public shaming by smart lightning that dims for people that did not pay their taxes. All participants laughed out loud at first sight. Then a fierce discussion started about the danger that these lights would cause. They immediately started about the issue that this type of punishment would punish other drivers too: ‘good’ drivers cannot see clear what is happening in front of them if the lights are out. This type of lights was seen as an old fashioned product: “it is like in the Middle Ages (...) you do not shame someone in public” - Participant 5. The participants continued their discussion agreeing that the smart lightning was sending a negative message. Participants wondered if this would be the right way of a government to regulate the city, they would prefer the government to encourage citizens instead of punish them. They also agreed that citizens should not automatically be punished: “what is the reason that they did not pay taxes? Maybe it’s because they need to feed their baby. I don’t think this is the right punishment.” – Participant 1. Finally, participants discussed the impact of automatic punishment. They compared the electric chair with the smart lightning, however they could not say whether they agree or disagree with punishment by machines: “on one hand it is not a fun thing to do as a human (...) so in that case it is better if it’s done by a machine (...)” – Participant 1, “But then there is still someone pushing the button” – Participant 5.

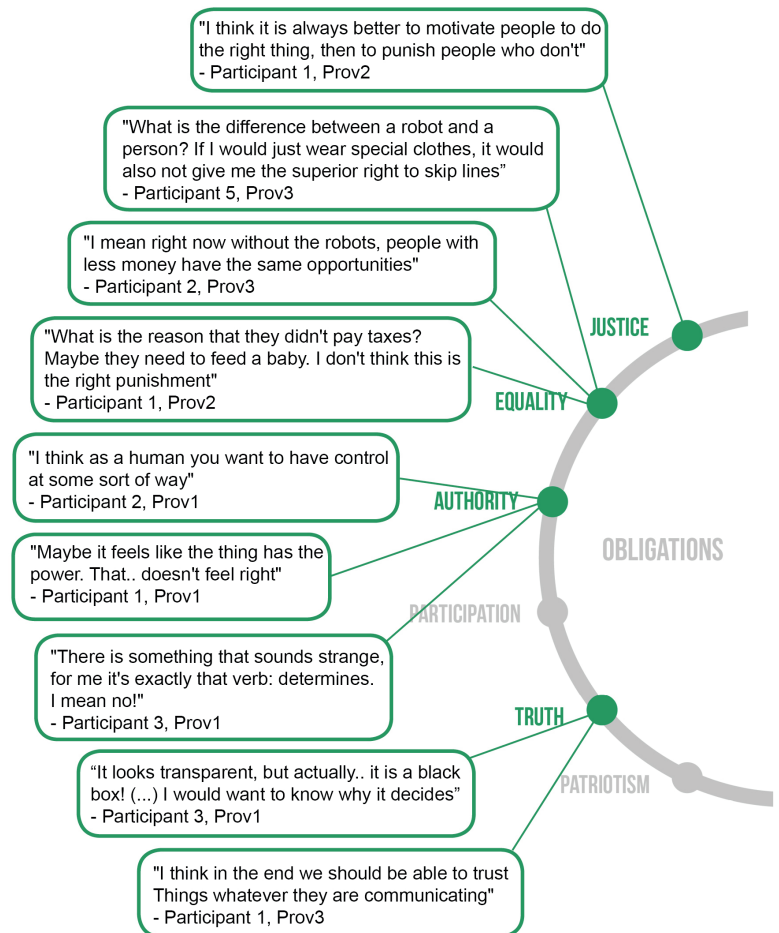
Third provotype - Equality and ownership

The third prototype presents a physical queue of Things and humans where robots are enabled to skip the queue as they would be more efficient. Participants imagined that these Things could also be owned and showed their concerns about the inequality that it would create between citizens that can or cannot afford to pay for a Thing: “now without the robots people with less money have the same opportunities” - Participant 2. Yet, participants do agree that priority for queuing is already happening and that they do not mind these priority rules: “if you pay your ticket online, you can skip the line (...) you just pay upfront to help save time sometimes (...) that is great” – Participant 3 and Participant 5. Furthermore, participants discussed the unequal rights of Things in the situation of the provotype. One participant stated that a Thing is not different from a human, and that it therefore does not have superior rights: “If I would just wear special clothes, it would not give me the superior right to skip lines” - Participant 5.

After this discussion, the question was asked if the participants would be bothered when these Things would communicate without citizens being able to notice it. Participants compared this situation with similar situations in the current real life: “It is similar to, maybe people sitting in the space chatting with each other (...) and you don’t know that they are communicating.” – Participant 5. Their conclusion is that they do not mind it if Things communicate with each other unless they share information about you as a person: “If the robot starts to send each other locations, what you are buying and when you do it (...) all this information can be critical information that can also be used against us” – Participant 3. They mentioned that they should be able to trust Things: “I think in the end we should be able to trust whatever they are communicating, if you want robots to help us” – Participant 1, “I wouldn’t think they were gossiping about us, or would think of evil plans they would do with humans, there should be a trust thing” – Participant 5.

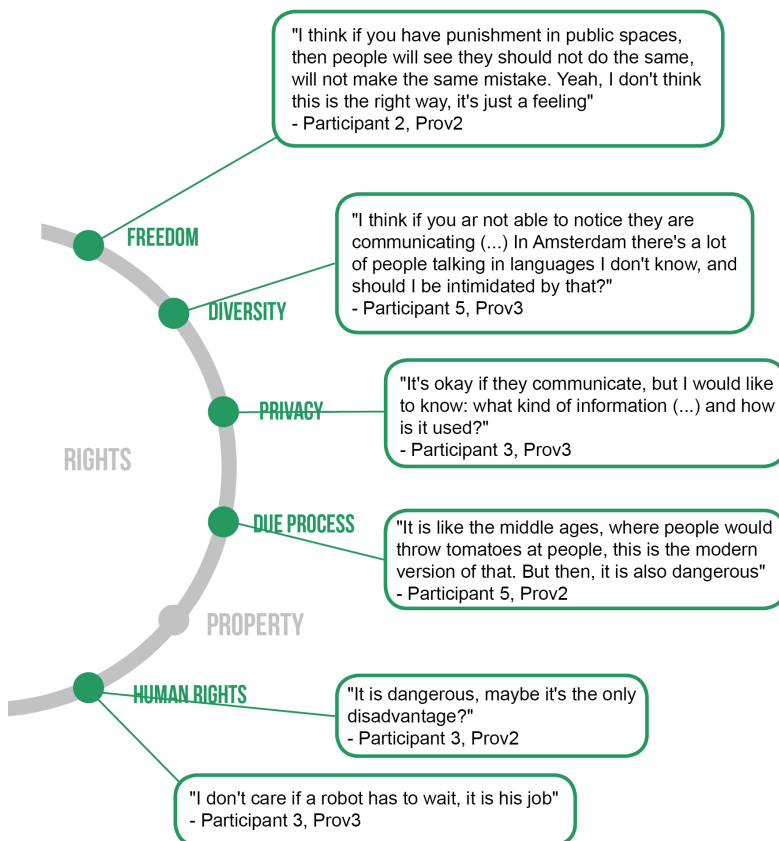
Ideation

During the ideation, participants came up with ideas for ‘better’ Things in the city. The shared ideas of participants for these better Things are described here.



▲ Figure 4.8: The topics discussed during the brainstorming.

1. Things that will contribute to the city or that have privileges in the city should be shared by the community, not owned by people.
2. A Thing should look self-explanatory, the purpose of a Thing should be clear. If a citizen would like to know more about a Thing, it should be possible to get more information about it.
3. The Thing itself should be visible, physical as well as digital (it should have an open data network).
4. Participants did not care for the Thing itself, the only purpose is to get the desired result from a Thing. As Participant 4 stated during the discussion of the ideation results: "Maybe Things can take over tasks from each other if they fail. It does not matter for example if a deliverer Thing fails to deliver a package. As long as the package arrives, I am happy".
5. Participants desired to have an expected interaction; they want to count on Things. They would not like to have a surprising element in the interaction.
6. Participants want control to divide tasks between themselves and Things, so Things deliver the desired results for them. Another option to keep control is that a Thing would make suggestions for them, as a human you know best what you want. Tasks that do not involve humans can be automated.



4.2.4 DISCUSSION

Democratic values

It seemed that participants were not merely talking about anti-social behavior, but rather about the democratic values of society. In order to validate this outcome, matching quotes are placed in the democratic citizenship model (chapter 3) to show how the discussion relates to the tables of the model (figure 4.8). The overview demonstrates which tables relate to the discussion subjects and to what extent each table is discussed. Equality, authority and truth are the most discussed tables. With equality, citizens seem to show their concerns that either Things or potential owners would be given unearned privileges and that it would result in unbalanced advantages as opposed to other citizens: "What is the difference between a robot and a person? If I would just wear special clothes, it would also not give me the superior right to skip lines" – Participant 5. As for authority, participants did not like Things to operate independently when a citizen is involved in the practice, they want to have a say in the decisions of Things as well: "Maybe it feels like the Thing has the power. That.. does not feel right" - Participant 1. Participants showed also their concerns that Things would violate the principle truth, as Things can hide information from citizens that might be relevant to share: "It looks transparent, but actually it is a black box! (...) I would like to know why it decides" – Participant 3. During the discussion, participants mainly talked about the need for Things to adapt to citizens' rights and the need for Things to hold onto the obligations of a democratic society.

The desire to be involved

As became clear during the discussion of the prototypes and the design criteria that the participants formulated during the session, there is a desire of the participants to be involved and informed as citizens about the Things in the public environment. During the prototype discussions Participant 3 stated: "I would like to know what and why it decides" and Participant 2 stated: "As a human you want a certain kind of control". Moreover, three design criteria state that Things that contribute to the city should be shared by the community, that the purpose of these Things should be clear and that the Thing should be visible to all citizens.

Purposes in the city and the role of Things

As became clear in the results of the sensitising booklets, participants' main purpose in the city was to get from A to B. Their practices are mainly functional and their attitude towards the

situated practices as well. This may be the reason for the design criteria that the participants came up with during the ideation phase. Participants indicated that they do not care for the Thing itself and that they would like a predictable interaction, these criteria seem to relate to the functional attitude of the participants during their practices. They also indicated that they want control during a shared practice with a Thing, which could be related to their functional attitude as they would like to reach the end goal as soon as possible.

4.2.5 CONCLUSION

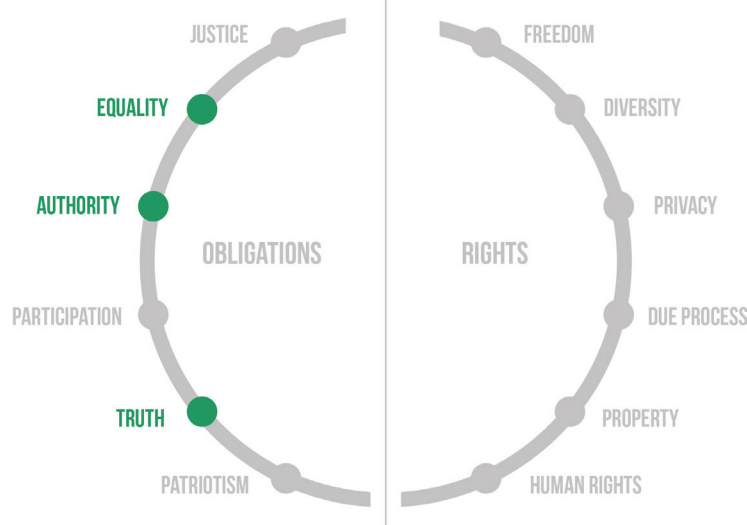
The behavioral values of the participants can be related to the tables of the democratic citizenship model (chapter 3). It seems from the results of this study that democracy forms the ground of public behavior. The results of this study show that participants expect Things to adapt to these values; Things need to respect citizens' rights and act according to the obligations that citizens also have. The participants were hereby mostly concerned about the possible imbalances of equality, authority and

truth with the introduction of Things in the city (see figure 4.9).

The participants stated that they would like to be involved and informed about Things in the city. Things should be visible and the purpose of a Thing should be clear. Moreover, Things that contribute to the city should be shared by the whole community. Participants mainly had a functional city experience; their main goal is to go from A to B as soon as possible. Their attitude towards practices in the city is functional and they expect from Things in the city that they have a functional attitude as well.

4.2.6 RECOMMENDATION

It is recommended to conduct further research using methods to discover if other participants will also come up with democratic values, as this study is conducted with a small focus group.



▲ Figure 4.9: The most matching tables of democracy to the discussion about Things and their behavior in the city.

4.3 CREATING BEHAVIOR FOR A THING

4.3.1 OBJECTIVE

This study is conducted in order to provide additional verification for the results of research 4.2. The aim is to discover if participants will come up with democratic values for Things in the city while creating behavior for a Thing themselves. During this study, participants will create good and bad behavior, two extremes, for an imaginary Thing based upon their ideas of public behavior.

4.2.2 METHOD

Participants

The participants of this study are visitors of the Thingscon event at Volkshotel Amsterdam. Thingscon is a yearly event about the Internet of Things. This year's theme was about the Ethics of design. Participants could select several workshops during the program, of which this study was one. 15 visitors chose to attend this workshop.

Structure

The workshop starts with a presentation about Things with small background information based upon the literature study. The participants are then divided into teams of 3; creating a total amount of 5 teams. Each team will create a story about a bad behaving Thing and a story about a good behaving Thing. In order to create their story for good and bad behavior, the teams followed twice an instruction of three steps:

1. The first step is the creation of a mindmap about good or bad behavior in the city. Participants are stimulated to think about behavior in the city in general, in order to prevent that participants get stuck in their ideation because they limit their imagination by behavior of digital devices.
2. Each team selects the two most interesting results of the mindmap. They are asked to imagine how the behavior can be expressed by the functions of the

Thing. After they need to decide for two scenarios how the Thing would behave:

1. How does the Thing interact with citizens?
2. How do the Things operate on their own in the city?
3. Based upon the scenarios, participants are asked to create a storyboard of one to three steps for each scenario. In order to create the story, participants needed to choose a situation that would fit with the behavior of both scenarios; e.g. location in the city, what the Thing is doing, who he meets, etcetera. At the end of each round, bad behavior and good behavior, the participants presented their stories to each other.

Material

Olly

The Thing that participants design for is a driving air purifier called Olly. The forms of Olly are based upon the Dyson air conditioner and a segwheel, creating a futuristic object. Several functions are added to give participants hands-on for their story. To inspire participants, three contexts of Olly in the city are shown beforehand.

Additional material

The participants are given paper and pencils to complete the three steps of the instruction. Stickers of Olly in different perspectives are provided as well to support the participants for the drawing of the storyboards.

Measuring

The material created by the participants will be used to study the results of the research. An overview of the materials can be seen in Appendix 8.4. Moreover, notes are taken by the facilitator during the presentations of each team. The results of the study are mainly based upon the storyboards that are presented by the participants. The mindmaps of the participants are used as a background story to understand the underlying reasons for the story that the participants created.



▲ Figure 4.10: Participants during the session.



▲ Figure 4.11: Olly and its functions.



▲ Figure 4.12: participants creating storyboards.

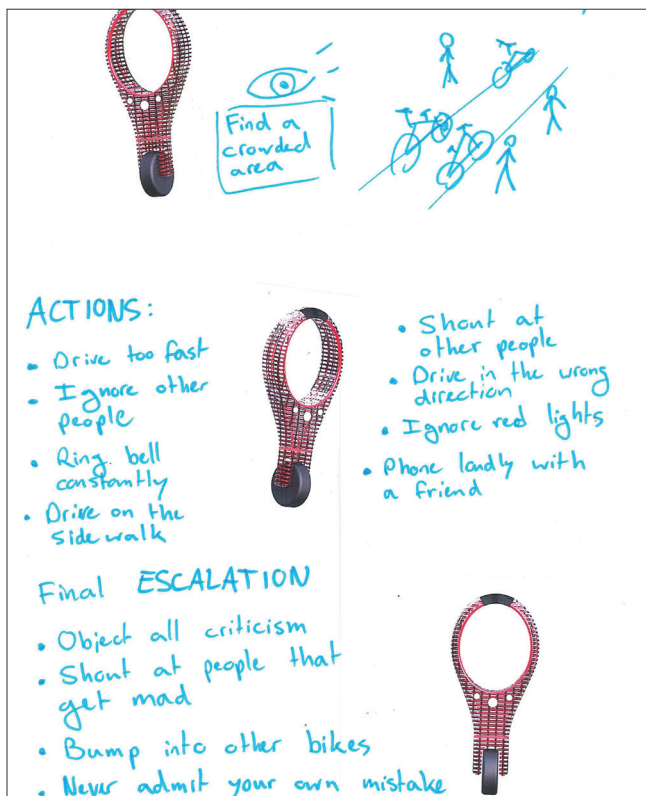
4.3.3 RESULTS

Relations between the stories and the democratic citizenship model

Most storyboards have a related story; the similarities in these stories can be related to the democratic citizenship model (chapter 3). Each similarity between the stories that can be related to the tables of the model is described here. For each relation, a storyboard is presented as a demonstrator.

The friction between freedom and authority

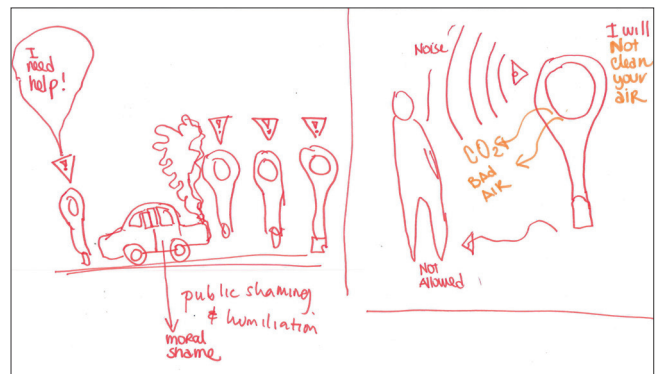
Participants described a bad Olly as a Thing that takes too much freedom in its actions and lacks the rules in public. Figure 4.12 shows a storyboard of an Olly acting as a 'cargo bike mom'; it ignores other people and the rules, yet it objects all criticism and does not admit its own mistakes.



▲ Figure 4.12: Storyboard about freedom and authority.

The balance for justice and authority

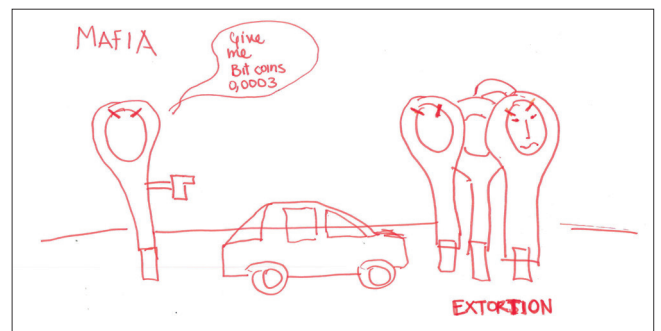
The participants described a bad Olly as a Thing with too much authority to punish citizens based on his own judgements about citizens. Figure 4.13 shows an example of an Olly that refuses to clean the air for a polluting citizen and emits the collected air pollution of the citizen in its environment as sort of punishment.



▲ Figure 4.13: Storyboard about justice and authority.

Human rights

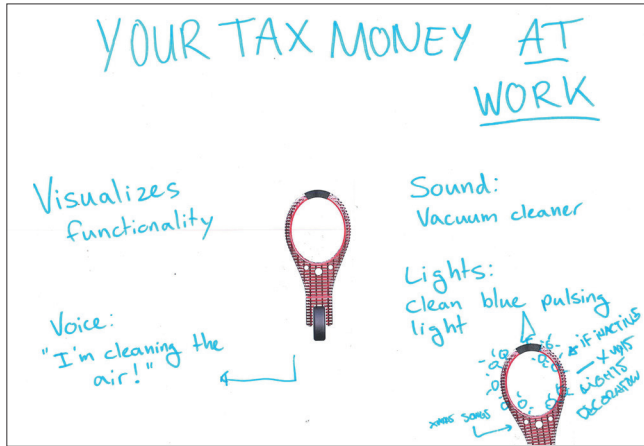
Participants created stories about a bad Olly that disrespects the human rights that humans have. Figure 4.14 shows an example of a group of Ollys extorting a driver because they know information about the user that they could use for bribery.



▲ Figure 4.14: Storyboard about human rights.

Participation

Most of the teams created a good Olly as a helper in everything when designing an Olly with good behavior. This resulted in some cases even in heroic stories, e.g. an Olly returns the stolen money to the rightful owner. One team came up with the idea that Ollys should prove they are worth to be around in the city and contribute, by reporting what they have done (figure 4.15).



▲ Figure 4.15: Storyboard about participation.

Privacy and Equality

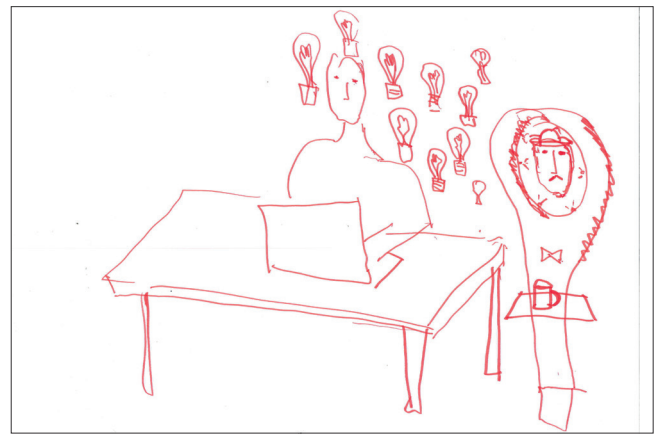
Three out of the five teams came up with an example of public humiliation. The stories show that public humiliation violates citizens' rights of privacy and shows undesired discrimination that violates the equality of citizens. These stories portray the bad Olly as a Thing that can decide to share personal information and to publicly discriminate citizens about their 'bad' actions (see figure 4.16 for an example).



▲ Figure 4.16: Storyboard about public humiliation.

Things as assistants for good behavior

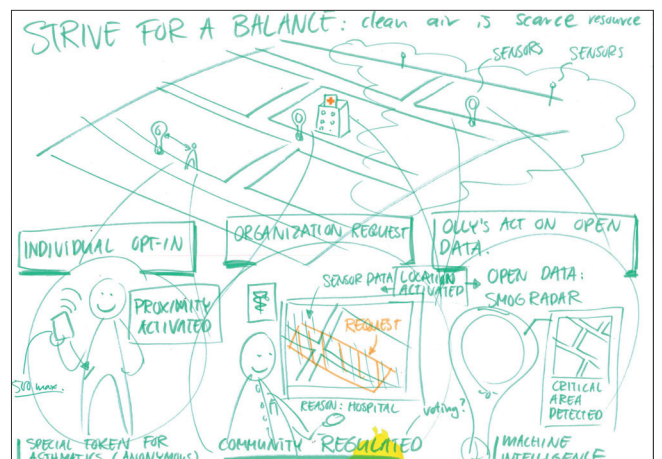
When designing for good behavior, participants started to portray an Olly as a personal assistant or a servant for all other citizens. They saw an opportunity in Olly being a creature that can fulfill everyone's needs. Figure 4.17 demonstrates a drawing of such an Olly standing next to a working person offering coffee and dressed with a bow tie.



▲ Figure 4.17: Storyboard about Olly as a servant.

Balance of control for good behavior

If participants were encouraged during the session to think more in detail about the way that Things could help or contribute, they created a system or service that strives for a balance of control between Things and humans. A team of which a member was already familiar with the concept 'democratic IoT' thought about such a system, shown in figure 4.18.



▲ Figure 4.18: Storyboard that introduces a form of balance.

4.3.4 DISCUSSION

Concerns about the seemingly good intentions of Things in the city

Comparing the stories with the tables of the democratic citizenship model shows a clear relation between public behavior and democratic values, but it also shows the complexity of public behavior. Bad behavior often includes a conflict between the tables. For example, if a Thing has a right of freedom in order to operate in the city, it can result in the violation of other citizens' freedom. This complexity is also identified in study 4.1 whereby participants indicated that one needs to be flexible and not too straightforward in following the rules (see section 4.1). With these stories, participants seem to tell that they doubt the good intentions of Things. They expect Things to result in being an unnecessary obstacle or even a danger for the rights of citizens. Figures 4.19 shows two drawings of the session that demonstrate the doubts or even fears that people have.



▲ Figure 4.19: Storyboards that show concerns.

The feeling of control is necessary for participants

The good behavior of Olly is mainly focussed upon a 'helping' Olly or even an 'assisting' Olly, portraying the Olly as a servant. Participants seem to tell that they want to have control over a Thing in the city. This may be a reaction towards their concerns of a Thing with 'wrong' intentions. Another reason may be that people are used to Things acting as servants. Nowadays, most Things are instructed by people to act and have a passive role, as described in section 1.1.

Relations between the democratic tables and the desired behavior for Things in the city

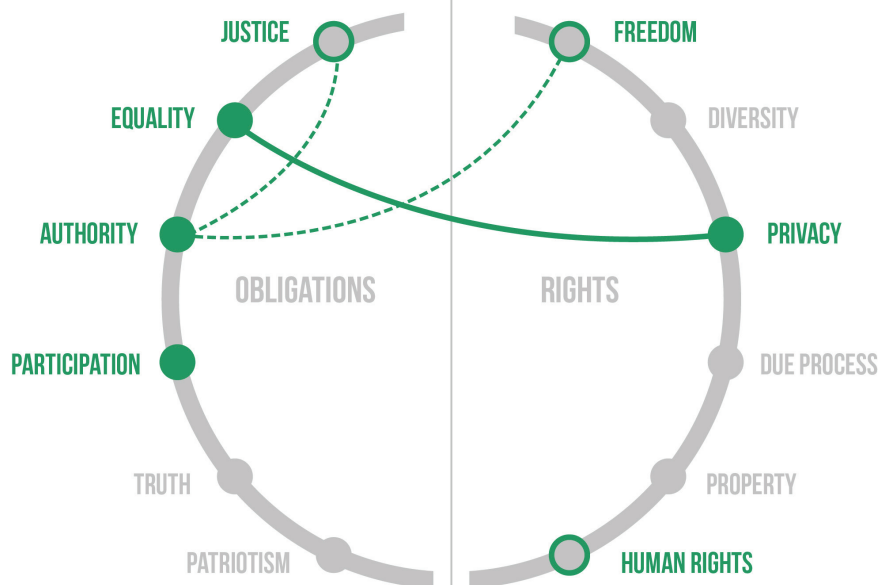
Figure 4.20 shows the final relations between the democratic citizenship model and the values found in the stories of the participants. The tables Justice and Freedom can be linked to Authority; they are not seen as identified tables themselves, but show the complexity of Authority. The table Human rights is also not identified as a completely related table. It shows that a Thing should not harm citizens; this finding can be related to the three laws of Asimov (Asimov, 1950):

1. A robot may not injure a human being or, through inaction, allow a human being to come to harm.
2. A robot must obey the orders given it by human beings except where such orders would conflict with the First Law.
3. A robot must protect its own existence as long as such protection does not conflict with the First or Second Laws.

These rules are applicable for all Things, or robots; the table Human rights is therefore not seen as a unique table for the behavior of Things in the city.

4.3.5 CONCLUSION

It can be validated with this study that there is a relation between the public values that Things need to adapt to and the tables of the democratic citizenship model. The identified tables are Equality, Authority, Participation and Privacy (see figure 4.20). Another result of this study is that the participants are concerned if Things can deal with the complexity of these public values. The shared solution that participants introduced is to create Things in the city as assistants of citizens; in order to keep control as a citizen and to protect a citizen's right.



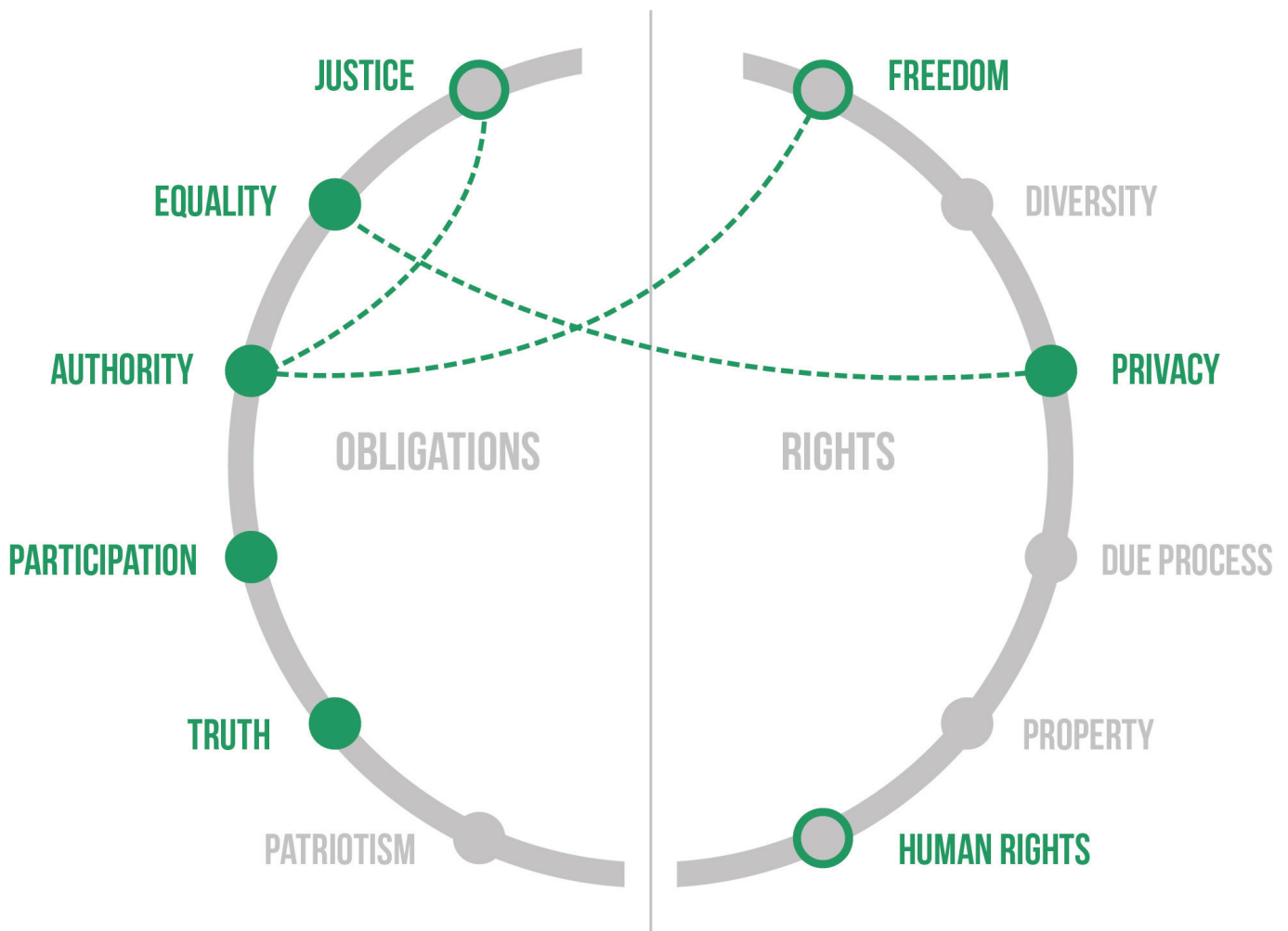
▲ Figure 4.20: The most matching tables of democracy to the storyboards about the good and bad behavior of a Thing in the city.

CONCLUSION CHAPTER 4

The results of all three studies show a relationship between participants' values of public behavior and the tables of the democratic citizenship model. Moreover, study 4.1 shows a relation between citizen qualities and the democratic citizenship model. Study 4.2 and 4.3 show that participants expect Things to adapt to the values of public behavior; the most relatable tables of the model are shown in figure 4.21. All three studies also showed participants' concerns of the complexity of Things to adapt to these values, as Things lack the ability of human judgement. Solutions that are provided by participants mainly demand superior control of citizens in a shared practice with Things in the city (as described in study 4.2 and 4.3).

RECOMMENDATION

This research has shown a direction for appropriate behavior for Things in the city; yet it does not present qualities and attributes for Things in the notion of co-performance as described in chapter 2. A synthesis is needed to transform the public behavior values into qualities and attributes for Things. Moreover, further research on the topic of democratic values for Things is needed. This series of studies has created a hypothesis, yet it is not a solid theory as it is based upon an individual model.



▲ Figure 4.21: The most matching tables of democracy to the behavior of a Thing in the city.

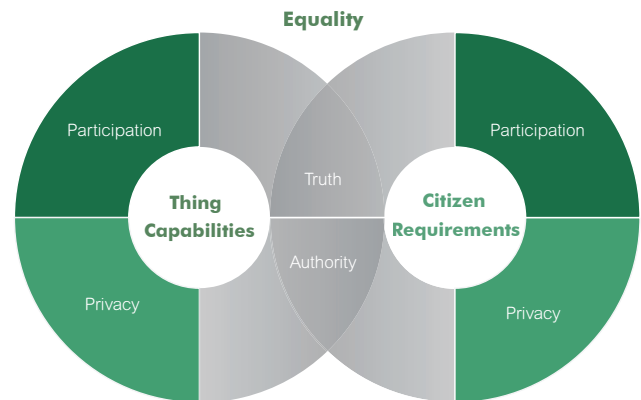
5. DESIGN QUALITIES FOR THINGS IN THE CITY

A synthesis is conducted to form a general conclusion from the results of the literature review and the empirical research. The synthesis leads to the goal of this master thesis: identifying qualities for Things with agency in the urban culture, to have Things perform appropriately during shared practices with citizens. The synthesis is conducted by analysing the meaning of the relevant tables of the democratic citizenship model, as described in chapter 4. These tables are put in the perspective of co-performance using the Thing Vocabulary in chapter 2 as a lens for this specific interpretation. A creative session about democratic design criteria for Things is conducted. The results serve as an inspiration for the synthesis (see Appendix 8.5 for the creative session and a complete overview of the results). The design qualities are based on the democratic tables that were identified during the practice based research as described in chapter 4. These are: Equality, Truth, Authority, Privacy and Participation. Each quality is described in a separate section, in which a coupling theme is identified for each theme. The first table, Equality, forms the main theme of the design qualities as this table matches with the vision of co-performance. Co-performance is the focus throughout this thesis as described in chapter 1.

5.1 EQUALITY – INTRODUCING THINGS AND CITIZENS AS PARTNERS

If Things with agency become part of the city, they will have an influence on city life and practices of citizens. It also means that they will perform in practices beside citizens. Therefore, it is stated in chapter 1 of this thesis that Things and citizens should be seen as equal collaborators for achieving human originated goals. However, it turns out that Things are more than collaborators. Concluding from the participatory sessions in chapter 4, citizens do have certain expectations of Things to adapt to the democratic values of the Dutch society. Things are not simply collaborators; citizens expect more from Things than simply collaborating in shared practices. Instead Things are seen as partners; actors that citizens can associate with, that can be understood and accepted as members of the city. Introducing Things as partners to citizens respects and acknowledges the democratic values of citizens. The vision of Things and citizens as partners means that the unique capabilities of human citizens and Things should be promoted by applying co-performance as a design framework, as stated in section 2.4.3. Hence, Equality is seen as the main theme of the design qualities and the remaining four

tables are interpreted from both the perspective of a citizen and a Thing; the requirements of a citizen and the capabilities of a Thing. Figure 5.1 shows the model for the design qualities based on the setup of the main theme.



▲ Figure 5.1: The setup of the design qualities model.

5.2 TRUTH – BRIDGING DIFFERENCES IN PERCEPTIONS AND INTENTIONS

Section 2.2 showed the differences between Things and humans: Things and humans have a different way of perceiving a certain situation and a different way of making decisions based upon their perception and inbuilt system. In other words, humans and Things may have different ideas and perceptions of the truth, and how to act in a right way according to that. It means that Things and citizens may become confused about each other's intentions. In study 4.3, participants showed their concerns about the 'wrong' interpretation by a Thing, as described in the discussion of section 4.3. Concluding, it is a requirement for Things and citizens as partners to bridge the differences in perceptions and intentions. The following design qualities are identified:

Citizen requirement: Ability to understand decisions made by Things

In study 4.2, participants expressed that they would like to know what drives a Thing's decisions. Hence, as a citizen it is crucial to first understand the perceptions and intentions of Things. A citizen should be able to create a mental map of the perceptions and intentions of Things to understand the decisions of Things. A mental map means a mental representation of what the Thing is sensing and what its intentions are. This mental map can be supported by the behavior and visual appearance of the Things. The Thing could for example show its sensitivities based on a sentence related behavior of a human, e.g. showing air pollution by a breathing motion.

Thing capability: Able to promote its sensitivities when there is interest

As described in section 2.2, a Thing's sensors can lead to unique insights that are invisible to the eye of a human. Things can use these sensitivities to act in a way impossible to citizens; e.g. they can clean the air with catalysis as they can detect pollutants that are invisible to the sentience of a human being. Even though citizens do not have the ability of sensing these sensitivities, it does not mean that these should not be shared to them. It would stimulate the partnership: it can help citizens to understand Things and their perceptions, and it can enrich citizens' knowledge. However, direct insights should be in the background of the Thing's interface design and not upfront, as not everyone is interested in shared sensitivities. Citizens living in the city are strangers to each other and strangers do not show their thoughts openly or are interested in others to do so.

Thing capability: Able to show the lack of ethical sensitivities in critical situations

As discussed in section 2.2, algorithms of Things do lack a lot of capabilities that the human brain has. Without consciousness and a morality, Things should never be put in situations where a capability of both is crucial. Yet, in a city context, with all its messiness and dynamics, it is almost inevitable that Things will become involved in ethical complicated situations. In the first place, it is important that a designer creates a system that avoids these situations as much as possible. Secondly, the behavior of Things should never seem as if Things are capable to act in an ethical or conscious way. A designer should therefore be cautious with implementing human-like features; a Thing should not look like a know-it-all but reveal its true nature and abilities.

5.3 AUTHORITY: ENTERING A CONTINUOUS AGREEMENT

In order to act as partners, Things and citizens should aim to reach a certain goal collectively. A collaboration for a shared goal means that full control will not be with either a citizen or a Thing. A non-controllable autonomous Thing would presumably result in inappropriate behavior to citizens, as was clearly demonstrated in the storyboards created by participants in study 4.3. However, giving full control to citizens means a loss of agency by the Thing and means that citizens need to spend more time to reach certain goals. Instead, the creation of a balance is proposed to enable Things and citizens to share the control for decisions. They will give each other the right to act. Things and citizens will engage in an unspoken agreement whereby both receive a space

to agree or disagree. The agreement enables thus an open dialogue between both. The following design qualities are identified to create an open dialogue:

Citizen requirement: Provision of space for negotiability

As stated before, citizens should have the space to agree or disagree with a Thing. If citizens doubt the decisions of Things, it should be possible for citizens to indicate their doubts either to the Things or to a human supervision team of the Things. A human supervision team is crucial for the acceptability of Things. The supervision team acts as a mediator between both. If a citizen reports a problem, the team should evaluate the capability of Things to negotiate and whether the Things were in their right in their reaction towards the citizen.

Thing capability: Able to react in different ways and to be partially directable in its actions

Things should be aware that citizens play an important role in reaching a certain goal and should therefore reflect with citizens on whether they are still working towards the shared goal. Therefore, citizens should have a partial input on the decisions or actions of Things if these actions concern them; e.g. when a Thing is parked in front of the car and the citizen wants the Thing to stand somewhere else. After negotiability, it is important that Things have the capability to respond accordingly and adjusts its actions if needed. Nonetheless, it should be stressed that citizens have a partial influence. Things have a unique contribution; therefore decisions by Things are negotiable and not always changeable. A supervisory team of humans is needed as a mediator in negotiations between Things and citizens in cases if a negotiation does not work out.

5.4 PRIVACY: APPRECIATING EACH OTHER'S ANONYMITY

Participants of study 4.2 stated that they would not mind if Things would communicate with each other on the street without you as a citizen being able to notice it, as long as Things involve you as a citizen if the discussion also has an influence on you. As one participant stressed, it is the same with strangers in the city; one is not interested in the other one's activities as long as he or she is not, indirectly, involved. Participants of study 4.2 mentioned that their main purpose in the city is to get from A to B and that co-performance with Things would be a sub activity. It means that citizens should have the feeling that Things can be strangers; citizens should not have the feeling that they need to guard or intervene with Things. Things should be a familiar and foreseeable phenomenon in the city.

Citizen requirement: Involvement in the background because of profound trust

As described before, trust means to a citizen that he or she feels that Things are capable to perform or exist in the city by themselves and that Things have no wrong intentions. As shown in the discussion of section 4.3, humans have a difficulty to trust the autonomous behavior of Things. Participants of this study would rather turn Things into servants that run tasks with no humans involved. In order for Things to be partners, citizens should be able to do their own activity without worrying about what Things are doing in the background.

Thing capability: Able to promote its self-reliance by showing its purpose

In order for Things to be regarded as strangers being on their own, Things need to prove that they are capable of performing tasks autonomously. One way is to design constant behavioral patterns for Things, as individuals and as groups, in order for Things to become predictable and a familiar phenomenon in the city.

Another way is to clearly demonstrate the purpose of Things by showing their intentions. Showing purpose proves to citizens that the Things are in the city for a certain reason and are only acting to reach their purpose. Service workers in the city also wear a uniform to make their intentions understandable. Marenko & Allen (2016) state that the intention of a Thing is best communicated by the behavior and form design that is true to the nature of the Thing's capabilities. When a Thing's design reveals the function, the Thing's purpose becomes quickly understandable for bystanders. The design should preferably refer to the function in a symbolic way and use a symbol that is well known by humans. This way the intentions are quickly recognizable by citizens as it is shown in an intuitive way.

5.5 PARTICIPATION: CONTRIBUTING TO RELEVANT CITY ENCOUNTERS

During the creative session of study 4.3, participants mentioned that it should be clear to citizens that the collaboration with Things improves the performance of practices in the city. Citizens need to be convinced about the added value of a Thing in order for Things to be accepted in the city environment. Things should be worth the investment: whether citizens are paying for the Thing by paying their taxes or whether citizens need to invest time. Moreover, Things should fit in the city and should not hinder citizens.

Citizen requirement: Engagement in collaboration based on intrinsic motivation

Engaging citizens for co-performance should preferably be based on the intrinsic motivation of citizens. As citizens already have a goal in the city, they will only be interested in the co-performance with Things when it is valuable to them and their limited time. As citizens will not always co-perform with Things for this or other reasons, it is needed that Things sometimes initiate collaboration. A designer should be cautious when designing initiating Things. Citizens in a metropolis are strangers to each other; they treat each other in a different way than people would do in villages where everyone knows each other. Things should therefore not be too straightforward in their approach to citizens; Things should be reserved in their nature, especially if the citizen at the other side is not familiar with Things. Engaging citizens based on their intrinsic motivation means that Things are able to fit into the city appropriately to urban culture.

Thing capability: Able to proof its right to exist by showing its performance

Things should prove to citizens that they have a right to exist. Things should be able to show their purpose and to indicate how well they are performing according to their purpose. Showing performance is important according to participants in multiple studies such as the design criteria session described in Appendix 8.5 and the contextmapping session in section 4.2. The design strategy to show the purpose of Things is already explained in previous paragraph. Showing performance can be done by adding variability to the design cues of the purpose. A design with variability can show the performance of Things in real time. For example, Things that clean the air can demonstrate that they are cleaning by making a breathing movement. Heavy or slow breathing communicates to citizens if it is working hard or if it is working slow and shows how clean the air is around.

6. THE DESIGN QUALITIES MODEL

The final result of the research of the thesis, the design qualities model, is presented in figure 6.1. This model serves as a framework for designing Things with agency in the everyday urban culture. The model is based on the concept Things as Citizens and introduces design qualities for co-performance between citizens and Things in the city. The design qualities model proposes a democratic dialogue between Things and citizens for co-performance in the urban environment. In other words: as partners that understand and act according to urban culture. The model is divided into two main circles that each represents the requirements of citizens and the capabilities of Things in order to create a democratic dialogue. Both requirements and capabilities are divided in four main themes based on four democratic values. The requirements and capabilities are summarised as follows.

Citizen requirements

1. Ability to understand decisions made by Things

Citizens should be able to understand decisions made by Things. An understanding should happen through the Thing behavior and capabilities. The Thing could for example show its sensitivities based on a sentience related behavior of a human.

2. Provision of space for negotiability

Citizens can question a Things' decisions and negotiate with Things to change their decisions or behavior. A human supervisory team should be present as a mediator in the background, in order to create harmony in the dialogue between citizens and Things.

3. Involvement in the background because of profound trust

Citizens require a Thing to work in the background, as citizens have an 'on the go' experience. It means that they need to trust that the Things are capable to perform or exist in the city by themselves and that Things have no wrong intentions.

4. Engagement in collaboration based on intrinsic motivation

Citizens should be engaged to co-perform with Things based on citizens' own intrinsic motivation. As citizens already have a goal in the city, they will only be interested in the co-performance with Things when it is valuable to them and their limited time.

Thing capabilities

1a. Able to promote its sensitivities

Things are able to share their unique sensitivities, e.g. sensor readings, to citizens if citizens show an interest in it.

1b. Able to show the lack of ethical sensitivities

Things are designed in a way that they avoid situations where decisions based on consciousness and morality are necessary. It is important that the design of the Thing and its behavior do not resemble human qualities as this could cause higher expectations than possible in certain situations or co-performance in general.

2. Able to react in multiple ways and to be partially directable in its actions

Things can react in multiple ways towards citizens. They open up space for negotiation as they are partially directable in their actions. However, not every Thing decision can be altered by citizens, as they are equal partners to each other.

3. Able to promote its self-reliance by showing its purpose

Citizens are strangers to each other. It is important that Things behave as strangers towards citizens as well. Things should prove their self-reliance, through predictable behavioral patterns or by clearly showing their intentions, in order to be accepted as strangers.

4. Able to proof its right to exist by showing its performance

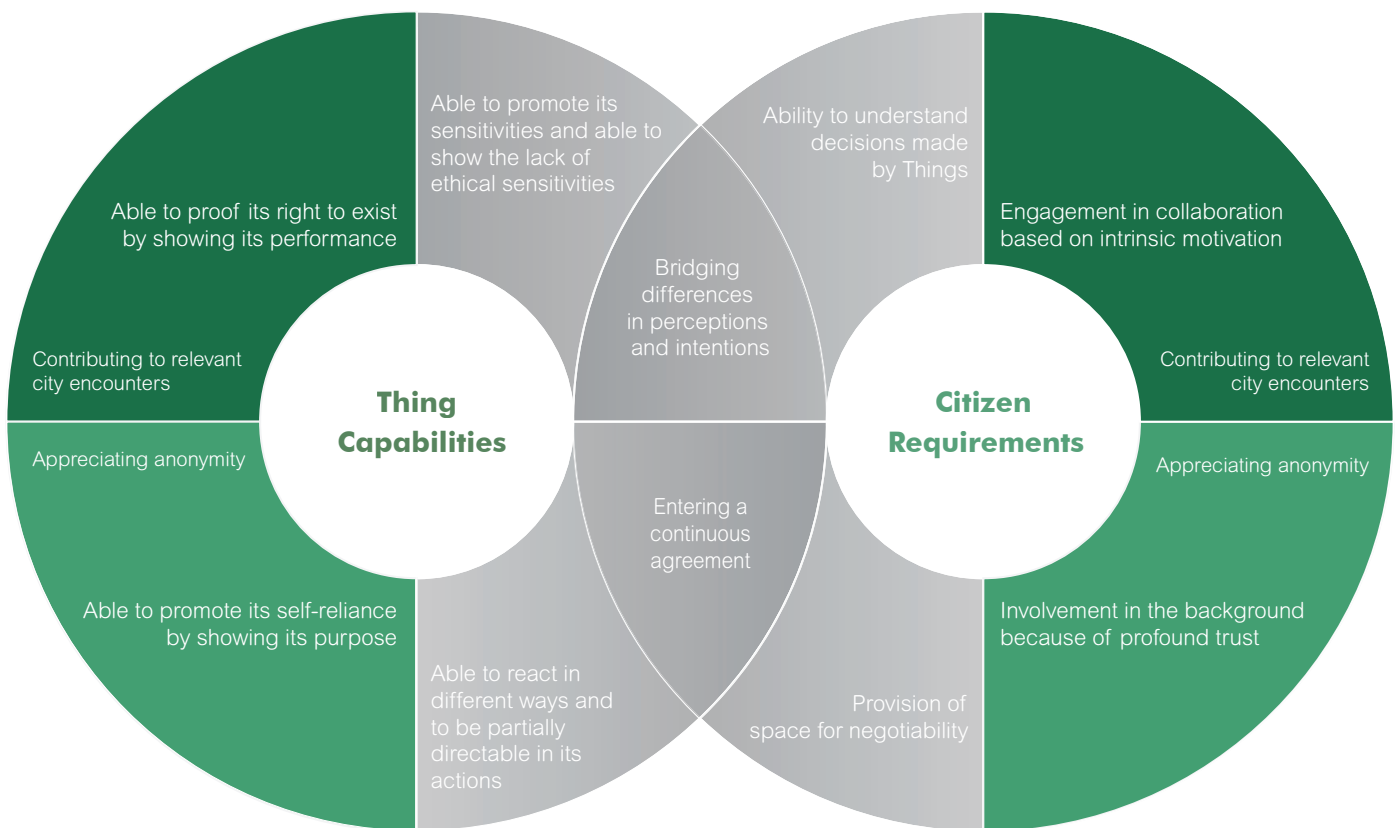
Things are capable to prove that they have a reason to exist and be part of urban culture in the city as they prove their contribution. Things are able to show their contribution by means of design cues that show the, valuable, performance related to the purpose of the Thing.

6.1 FURTHER RESEARCH

It is suggested to design a concept of three Things in the city according to the design qualities model in order to evaluate or validate the design qualities. The current result is based upon three studies about appropriate behavior values in public and a creative session with Industrial Design students, yet the design qualities are not applied to a design for practice. Creating a concept with the design qualities model enables to review each design quality and to refine them if needed. Moreover, the concept could serve as a demonstrator of Things as Citizens.

Therefore, a second part is added to the thesis whereby a concept is developed in the context of air purification using the design qualities model. The concept is evaluated in a user test to evaluate the design qualities. The concept is described in a second report.

Things as Citizens



▲ Figure 6.1: The design qualities model.

7. BIBLIOGRAPHY

Asimov, I. (2004). I, robot (Vol. 1). Spectra.

Avdalayan, H. (2017). Algorithms - A way to create elegant (compact) and good (fast) programs. Retrieved at 29 December 2017 from <https://www.ipc.am/en/course/?l=algorithms>

Birattari, M. (2011). Swarmanoid, the movie. Retrieved at 29th of December 2017 from <https://www.youtube.com/watch?v=M2nn1X9Xlps>

Bishop, C. M. (2012). Pattern recognition and machine learning, 2006.

Bostrom, N., & Yudkowsky, E. (2014). The ethics of artificial intelligence. The Cambridge handbook of artificial intelligence, 316-334.

Bowles, C. (2013). Designing with context. Retrieved at 29 December from <https://www.cennydd.com/writing/designing-with-context>

Candy, L. (2006). Practice based research: A guide. CCS Report, 1, 1-19.

Cila, N., Smit, I., Giaccardi, E., & Kröse, B. (2017). Products as Agents: Metaphors for Designing the Products of the IoT Age. In Proceedings of the 2017 CHI Conference on Human Factors in Computing Systems (pp. 448-459). ACM.

De Waal (2015a). The citizen in the smart city: How the smart city could transform citizenship. Retrieved at 29th of December 2017 (Unpublished)

De Waal (2015b). A city is not a galaxy: Understanding the city through urban data. Data and the city.

Dunne, A. & Raby, F. (2017). FAC Critical design. Retrieved at 29th of December 2017 from <http://www.dunneandraby.co.uk/content/bydandr/13/0>

Electronic Tutorials (2017). Sensors and Transducers. Retrieved at 29th of December 2017 from http://www.electronics-tutorials.ws/io/io_1.html

Evans, D. (2011). The internet of things: How the next evolution of the internet is changing everything. CISCO white paper, 1(2011), 1-11.

Giaccardi, E. (2017). Personal interview for the TU Delft: Can Things design Things?. Retrieved at 29th of December from <https://www.tudelft.nl/en/ide/research/discover-design/can-things-design-things/>

Giaccardi, E. & Nicenboim, I. (2017). Mind the Step - Affective Things, entanglements of a connected home. Retrieved at 29th of December 2017 from <http://www.mindthestep.nl/affective-things.html>

Giaccardi, E. & Smit, I. (2017). Pure Air for Cities of Things - Introduction Presentation. Retrieved at 29th of December 2017

Houben, S., Marquardt, N., Vermeulen, J., Klokmose, C., Schöning, J., Reiterer, H., & Holz, C. (2017). Opportunities and challenges for cross-device interactions in the wild. Interactions, 24(5), 58-63.

IBM (2017). The quest for AI creativity. Retrieved at 29th of December 2017 from <https://www.ibm.com/watson/advantage-reports/future-of-artificial-intelligence/ai-creativity.html>

Klien, G., Woods, D. D., Bradshaw, J. M., Hoffman, R. R., & Feltoovich, P. J. (2004). Ten challenges for making automation a "team player" in joint human-agent activity. IEEE Intelligent Systems, 19(6), 91-95.

Kuijjer, L. & Giaccardi, E. (2017). Co-performance: Conceptualizing the Role of Artificial Agency in the Design of Everyday Life. Retrieved at 29th of December 2017 (Unpublished)

Mobus, G. (2013). Sapience, Evolution & Eugenics. Retrieved at 29th of December 2017 from <http://faculty.washington.edu/gmobus/Background/SapienceExplained/1.sapienceintroduction/sapienceIntroduction.html>

Smit, I. (2017). Things as Citizens in the inclusive smart city. Retrieved at 29th of December 2017 from <https://labsinfo.nl/things-as-citizen-in-the-inclusive-smart-city-f773567aa31d>

Rowland, C., Goodman, E., Charlier, M., Light, A., & Lui, A. (2015). Designing connected products: UX for the consumer Internet of Things. " O'Reilly Media, Inc."

Tye, M. (1997). Qualia. The Stanford Encyclopedia of Philosophy (Winter 2017 Edition). Retrieved at 29th of December 2017 from <https://plato.stanford.edu/entries/qualia/>

Verhoeven, C. J. M. (2016). Robotics for future presidents, Leading experts on the next revolution in automation. Del : Robotics Institute, TU Delft.

8. APPENDICES

8.1 SENSITIZING BOOKLET

The setup of the sensitising booklet and the arrangement of assignments are based upon the booklets that serve as an example in the theme closet Contextmapping in Studiolab. The booklet is divided in two parts. The first part is about the city experience and the second part is about the future of AI and IoT and participants' opinions on it.

First part

The first part is set up as a step by step approach to get participants into thinking about their values of public behavior. The assignments also serve as a means to understand citizens' general experience in the city. In order to inspire participants, inspirational material is provided along with the booklet. The assignments in the booklet are as follows:

1. City description - a short description of their perception of Amsterdam
2. Activities - a timeline in which they express what they do in the public spaces and how they feel during their activities
3. Best and worst experience - the best and worst experience that people had in public with another person
4. Value circle - a circle map as a tool to express for participants what their values are in a public environment ranked to importance (middle of circle stands for most important values and outer circle stands for less)

Second part

The second part has a 'before and after' approach to discover participant's view and expectations of IoT in the city and human-machine collaboration. The two assignments contain a direct question at first. The second question of each assignment serves as a follow-up after material is shown; this question can change participants' opinion on the topic. For the IoT question, two fragments of public scenarios in the series Black Mirror are shown. For the Human-machine collaboration, participants have to conduct a jobtest of Hubot; Hubot is a project that stimulates people to think about the added value of robots in professions.



Figure 7.1: Inspiration material for the assignments

1. Future IoT and Black Mirror



2. Human-machine collaboration and jobtest

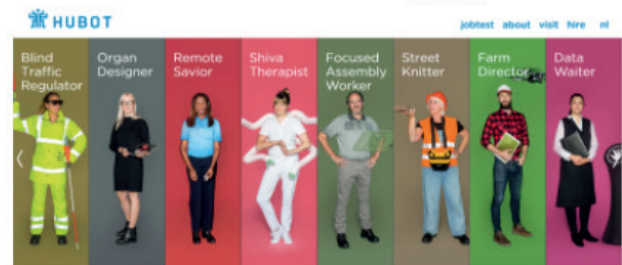


Figure 7.2: The two assignments

8.2 PROVOTYPES

Provotypes are created to demonstrate and to provoke discussion between participants. These provotypes are based upon my interpretation of anti-social behavior. Thus, simultaneously my assumptions and conceptions of anti-social behavior will be tested during the session.

Mapped social behavior values

The desired social behavior values are mapped into a graph after being collected by an own brainstorm and some websites online about good citizenship. They are mapped in a graph with two axes: mind your own business vs care for others and rules and folkways. The first axe divides the values in what people should keep for themselves and what people need to share. The second axe shows what strict public rules are and what unwritten more subtle rules are. After, the values are clustered; three clusters are chosen to form three different anti social objects.

Idea generation for anti-social objects

During a second brainstorm, public objects and the three clusters are combined in order to create ideas for the provotypes. Three ideas were chosen and formed into final concepts of antisocial things. In order to explain the intention of the concepts and to create a story, small texts were added to the scene.



Figure 7.3: The graph of the social behavior values before and after clustering

8.3 TRANSCRIPTION OF THE PROVOTYPE DISCUSSION

Provotype 1: Participant 2 is writing

I: The first one is a transport service, it determines when citizens will move around. It's very optimized, very efficient, there is no need to schedule; it just says: hey you can go and you step in. What do you think?

Manon: I am a bit confused by the phone, what is it like, call the thing like I call an Uber?

I: No it picks you up, it decides when you go. If you miss it, well then it is up to you. because it is efficient it should be accessible for all the citizens.

Participant 1: So it is more like a train, hop off and hop on. I and Participant 2: Yeah

Participant 5: It looks like a sort of a room.

I: yes it is more like a room, but it is more about the system.

Participant 5: Okay.. So it drives around? I: Yeah. And then: for instance, I want to go to I don't know to the westerpark from here, do I let the thing know that?

I: hmm, yeah you let the thing know that, but the thing decides when you step in. So you cannot say what time.

Participant 5: So that's what happens with the phone?

I type.. I: Yeah so the thing decides when you will go and you type in where you want to go, but you cannot decide what time. Participant 5: Okay

Participant 3: but if I have an appointment, at that place?

Louise: That's your problem because it is about efficiency.

Participant 3: efficiency, so which point of view, in this case?

Participant 5: how many of these things drive around? Is it like a hundred or only ten? In Amsterdam for instance.

Louise: Let's say, enough people to drive around.

Ehm how would it make you feel say if there was a thing that would drive around and would decide for you?

Participant 2: I am still struggling with the efficiency, because, is it more efficient for the thing itself?

Participant 5 laughs: yeah.

Participant 2: Right? I: Why?

Participant 2: because you can't choose when to go in or go out. If I need to be there at half past 10, and I can't be there at half past 10. So how is that efficient?

Participant 1: Or, if it is say super smart, so it would drive by my home by the time I need it.

Participant 5: yeah, yeah, that is the second version, haha. Participant 1: it is also just a bus with two seats, haha

I: What do you think if this device would decide for you? How would it make you feel?

Participant 3: I would want to know why it decide? So why did this kind of car decide to move back to 10 and not 11.

Participant 5: maybe.. it makes me feel confused.

Participant 1: yeah, cause if you walk outside and you

see 100s of these things and you can just step into it, it doesn't matter. But if it is like car to go, then it would be pretty annoying.

Participant 5: hmm hmm.

Participant 1: Then I would not see optimized efficiency. Or.. like I said it knows my schedule and I want to drive by then it works, smart pick up service, then I can see the added value

Participant 5: Is there some domain use case for this bus?

Participant 1: Tours? Haha.

Participant 5: yeah maybe, like a tourist attraction to see the canals, because I am on a tourist vacation and I have all the time, it doesn't matter?

I: No, see it as the Uber, maybe the other way around, if the thing should adapt to you, isn't that annoying for the thing?

Participant 1: yeah uh, we still don't care about the thing. Participant 5: yeah. Participant 1: but eventually it might be uh, haha. The thing will get an opinion too.

I: Do you think that things will get an opinion?

Participant 1: I am afraid so, I don't know if it will get that far. Participant 5: It depends on whether that's..

Participant 1: our plans were. Participant 5: yeah.

Participant 2 (summarizes): So about the timetable, what do I write down. So we are now thinking: what is efficient for us and not for the thing? Participant 1: yeah

Participant 2: and maybe it is the other way around (looks for confirmation). Participant 1: hmm hmm.

Participant 5: yeah and that would become a question, because why is it important to be efficient for a thing? because it... Participant 2: doesn't have an emotion. Participant 5: yeah.

Participant 2: So also the question, what is more important: the thing or the person? Participant 5: yeah, that's for me not a question yeah. Participant 1: On the other hand, the ns also determines when we will be driven around. Participant 5: true, but you still know when these things will go, or approximately with some delay, but still.

I: Participant 3 what do you think?

Participant 3: There is something that sounds strange and for me it's exactly that verb: that the pick-up service determines. Participant 5: yeah. Participant 3: I mean.. no! (laughing) it means that this pick up service analysed some parameters and based on that it makes a decision, and, that is a bit scary and this is something maybe, does it fit with my need? So, I would try it, definitely, but with a pessimistic approach. Participant 5 (laughing).

I: So.. Participant 3: like that, it is like a black box.

Participant 5: it looks like a black box almost.

Participant 3: yeah, it looks transparent, but actually: it is a black box! So I would like to know more.

Participant 1: yeah cause I don't see, why this would be better than other options.

I: maybe it's not.

Participant 5: Yeah it has some mystery around it ofcourse, maybe that would appeal to people. I don't know, like a surprise element. Participant 1: maybe it is free for people. Participant 5: Yeah exactly, maybe it's free, when is the thing going to pick me up? It's might be an interesting. Participant 1: eeh.. service, I: yes (agreeing). Participant 5: I don't know, maybe it will be something that people would eventually think, but I don't know if that's currently the case. Not for me, well I would try it eventually. I: would you say then it's good design? Being honestly Participant 1: At the moment. Participant 5: If it's from a user perspective, and the user is the person being transported with the thing, then no. No. I: Why should the thing wait for you? If that's the case, if like for Uber it has to wait, wouldn't it be annoying for a thing to wait? Participant 5: No, it is made of, what is it made of actually; wood? It is not a living thing Participant 1: he doesn't have a time schedule. Participant 5: no, the thing is created by humans.. for a reason. If that reason is.. Participant 1: to help Participant 5: yeah, the reason should be to help people in an efficient way and not.. A thing is not created because than a thing would have an opinion. Participant 1: I hope that things don't get an opinion. Participant 5: yeah, and if they get, I miss their.. I would like to let them be more friendly than this. Participant 1: or have a face. Participant 5: a face indeed. I: Participant 4, what do you think? Participant 4: About which part? I: About ehh.. What if things get an opinion? And decide for you? Participant 4: hmm.. From this picture? I: No... hmm.. yeah what if this thing can decide for you?.. Should it always adapt to you? Participant 4: Yeah it has to adapt it's, to some degree yeah, to some point, cause otherwise it has no point and clueless. and it should be adopted how we behave in the future. I: And Participant 2? Participant 2: Yeah, I just can't accept that the thing would be more.. how do you say it? For me it really feels like the person should be more able to be efficient, because the thing is made by the human, so what's the use? Participant 5: yeah. Participant 1: and maybe it feels like the thing has the power. That.. doesn't feel right. Participant 2: yeah, it doesn't feel right if the thing does. Participant 5: also because the looks, it likes a box, it is like a glass prison that you are driven around in. Maybe if it was open than it would be more appealing. More from a.. Participant 1: (?) Participant 5: No true but from, of course, but then from a recreational sort off.. Participant 1: yeah. Participant 5: use, so like: oh, yeah, but this is actually a functional, just like where to go, I want to get from point A to

point B, this is a solution for that. Participant 2: Would you say the thing is not.. is not functional if it is not efficient for the user? Participant 5: If that is what you mean by functional, but I would say.. Participant 1: it is preferable: Participant 5: No, I would pick another word for it. Participant 4: but it is uber right? I: No, I would say it is the opposite. So with uber you can decide if you want to be picked up, but this thing decides when you will be picked up Participant 4: I think Uber, that I wouldn't mind, I think it maximizes, ehm, the benefit of all, so as an individual you might, get a car, it takes longer, because that's for, what everything was telling, so to optimize the efficiency, they're kind of, I mean, determine where you are driven around, as an Uber Participant 1: So you think this is Uber in the future? Participant 4: Yeah I think that is what we have now, it is not in the future. It is.. in the present.

Provotype 2: Participant 5 is writing

Participant 5: Ha, laughing (Participant 3, in background). Participant 1 looks confused. Participant 2 looks like she is processing. Participant 1: Interesting Participant 3: What do you mean? I: If you don't pay taxes, you don't get the light. Participant 3: On this day and time? Participant 1: (?) or something from the state? It is quite honest actually, but it is.. I don't know I.. Participant 5: but is it for cars, people drive in cars, or is it for people who are walking? I: Just wherever you are Participant 2: But how does it work? If the person in front of you did not pay taxes you don't.. I: Imagine your path will be lightened and for the other won't Participant 1: No, I think they should be punished on a different way because now the one who is driving behind is also missing something, it is way too dangerous. I: Do you think it is honest and right that people that can't pay taxes don't get light? -- Participant 3, Participant 1, Participant 5: No -- I: Why would that be? Participant 3: I don't know if I would (point marte?) Because I see too many disadvantages Participant 5: yeah Participant 3: So yes for example, it's dangerous, maybe that is eh, maybe it's the only disadvantage, it is evil (?) Participant 2: yeah true Participant 1: I think light doesn't cost anything anymore so I don't think it is right way to tackle this problem. It is not like you are going to pay for it, because I think light will be free in the future. So in that case it doesn't fit the, it is not a right punishment. Participant 5: hmmhmm Participant 1: Because I see this as a punishment for people who don't, yeah. I: Do you think people should be punished in public

like this?

Participant 5: It is like, eh, the middle ages. Where people were put on the Participant 1 whispers: shame, shame Participant 5: I don't know what it's called, Schandpaal, You know, and they would put people who throw tomatoes at them and: áh, he stole something! It's, yeah, this is the modern version of that. But then also dangerous, because the people who, if people were only throwing tomatoes probably they won't be hurt by those, but if you are driving and then

Participant 2: you would also punish the other users

Participant 5: yeah (agreeing together), you would maybe drive or crash into the person who does pay the taxes, because you didn't see it or something It effects more people than only.. the one Participant 5: yeah that is a nice one

I: Do you have something to add Participant 4? What is your opinion?

Participant 4: If we are talking about state tax then no Participant 2: No

I: So it's wrong to punish people and to involve others, what if it wouldn't involve other people, like that if there would be a sort of public punishment in a subtle way, would that be a solution? Or shouldn't there be no punishment at all?

Participant 2: you mean for no punishment at all, I: in public space, Participant 2: in public space

Participant 2: I think if you have the punishment in public spaces then people will see they should not do the same, will not make the same mistake, like: look what happened to him, hope it would not happen to me, so they will behave. Yeah I don't think this is the right way, I don't know, it's just a feeling.

Participant 1: I think it is always better to motivate people to do the right thing, then punish people who don't, Participant 2: yeah maybe that is what doesn't feel right about it.

Participant 1: except for humans

Participant 5: but then still you don't shame someone.

Participant 1: yeah exactly. Participant 5: you don't get on the (schandpaal imitation) Participant 1: shame shame, Participant 5: but you get on the news or something, but not people saying: yes this is, pointing their finger and something.

Participant 3: At the beginning you said that for you a thing is something with which you interact, so you as a person gives something and the object comes back with something else, that can be information relating, or a light related to any form of information. So in this case the messages are two, or actually one, it is the light, the output behind that light is the message that this debt driver didn't pay the taxes. I don't think.. I wouldn't be interested in that kind of message in a public space.

I: Because?

Because.. I don't think it is an efficient way to fix problems. Yeah, it is exactly what they just said Participant 1: And I am also immediately thinking like; what is the reason that they did not pay taxes? Maybe it's because they need to feed their baby. I don't think

this is the right punishment.

I: Then do you think, if the government would decide well there should be a way of punishment, should it go through humans or through things?

Participant 5: eh.. for not paying taxes?

I: yeah, like if they decide well there should be a form of punishment, even if it is correct or wrong, should that be done by humans or things?.... Assuming that a thing does not have a feeling

Participant 1: exactly, so on one hand, it would be like if I go back to middle age, I think it is not a fun thing to do as a human, to shame someone, so in that case, I think, it is better if it's done by a thing. It is the whole reason why they have electrocution, because then it's done by a machine and not by a person. Ehm, on the other hand, it is a human mistake, so I think it is more equal to let a human make an alternative or something.

I: do you agree Participant 2?

Participant 2: Yeah I think that's yeah.

Participant 1: but now it is an ethical discussion

Participant 5: but then there is still someone who pushes the button. Participant 1: Yeah true, Participant 5: would that be would you call in this case the electric chair a thing, or is it just a tool that a person uses to do something?

I: I think the regular one is not a thing.

Participant 1: because still the human makes a decision, Participant 5: yeah, Participant 1: but the whole reason that they have a chair could be that there is something in between the person that pushes the button, because they can also just you know (makes knife move)

Participant 2: yeah it feels different I think

Participant 1: because now someone is killing someone, and now the chair is killing someone also, although there is one person who pushes the button.

I: Participant 4, do you agree that what we were just talking about? If there's a machine there is always someone hitting the button.

Participant 4: Agree to what exactly?

I: Well, what is your opinion about everything that is being said about

Participant 4: about the electric chair?

I: yeah related to punishing people in public

Participant 4: It's rare these days, this thing

Provotype 3: Participant 3 is writing

I: Okay the third one, I am curious what you think, Participant 3

Participant 2: What do they do?, Participant 1: yeah what's it for?

Participant 3: So the robot instead of you in the line, so you leave a robot in the line

I: maybe, the idea is that if there is a robot, it gets in front of you in the line, everywhere like at the bakery or maybe in the bank or wherever

Participant 3: No! Participant 5: Why?

Participant 1: How I see this, I think, rich people are able to buy robots first, Participant 5: yeah, like the

guy with the big tie, he is a rich person, Participant 1: yeah but he still doesn't have, like, he's looking at his watch, like why don't I have a robot? Participant 5: haha, Participant 1: so I think no, because then people who have money are able to by robots and then they are first, that's why Participant 2: yeah, but isn't that..? Participant 5: fair All three laughing. Participant 2: No no no, I mean right now without the robots people with less money have the same opportunities. Participant 1: exactly Participant 5: But I don't understand why the robot has higher efficiency? They will be able to skip human queues. Participant 1: If it's saving a life yes you can go first. Participant 5: Why can't a person..? What is the difference between a robot and a person? Why aren't there then persons who wear special clothes? I don't know. When I have bought my special clothing which gives me rights to skip lines. Why is it the robot? Participant 1: Or a skip pass from the line. Participant 5: yeah. I hate those people that buy. That's exactly the thing. Participant 2: yeah, they pay. Participant 5: People pay a hundred euros, or maybe not a hundred, and they are able to skip the normal people, plebs, yes. I: More efficient in a way that it doesn't have to explain anything and that that you have the situation: ah this is what you want, here you go and then the robot just goes away, while with humans you have your bankcard and you have to explain what you want. Especially with large cases like Pau: How does the person at the counter know what the robot wants? Does it get a message? I: Imagine there is a system for it Participant 1: Well than I imagine that there will be two queues so a robot that is helping robots and a human that is helping humans -- Yes -- all agreeing: Participant 2, Participant 5, Participant 3 Participant 3: It's like if you go to the museum and you buy the ticket online, or if you have a museum card, so you can skip the line of the tourists, Participant 5: yeah that is fair, Participant 3: they don't buy the ticket online, so you have to wait, but you have your ticket online, maybe just 2 minutes before, and then you can skip the line, that is great. Participant 5: yeah exactly, if it is about the tourists then yeah, Participant 3: yes, well, Participant 5: no ofcourse that's just, eh, you don't pay extra or something, Participant 1: no you don't, so you just pay upfront to help save time sometimes, Participant 5: exactly Participant 5: yeah I don't get this one. Participant 1: so maybe if I place this in a bakery situation, I don't know why anyone would wait for the bakery, then, I see it is Photoshop, so maybe not that many people would wait for the bakery, but Participant 5: maybe it is not even a bakery, Participant 1: Then for example, that one in the front is from a company that knows what he needs, because he is coming to get the same delivery every day, and then it would probably be ready at the counter, like brood, and the guy in the front that doesn't know what he wants, so it takes

more time to decide what he needs, to the line in total will be shorter, if there are robots that already know what they needs. Participant 5: So it is similar to, Participant 1: I also know humans who are waiting in line and know exactly what they want and so then it doesn't save time and it is just annoying for the humans.

Participant 5: But it is also like in the supermarket, and I have a lot of shopping products in my cart, and the guy that quickly wants to pay for the apple, and then it is nice if he asks and I will say: "yeah, sure" Participant 1: yeah, that's the thing!! Like, when someone is standing behind me with just one apple, Participant 5: yeah, Participant 1: I would usually say "go first", but if someone asks me like "Oh, I only have one apple and I am in a hurry", then I am like *makes disapproving sound*. I don't want to give him the time. This thing thus should be offered, and not demanding it.

Participant 5: But that would be a bit of the robot also right? Then it would be a bit better maybe, if the people have to take a moment to decide and the robot takes just one second and then it goes away again Participant 1: yeah so if there is a queue for people that are just getting to get things that are already ordered than I don't mind. Like with the museum pass, if there is a line and you are coming in with a museum pass, then: fine. Participant 3: Yeah, but still you have two lines, different lines, you don't mix between the two Participant 5: It really depends where this is used, in a bakery or in a post office or on a train station where you buy tickets, it can be used without people getting annoyed

I: and would you say, would you rather than have robots with a community preference, so if they buy train tickets for a community purpose they get in front of a line, or would you say: oh yeah also for people that have a robot, these robots get into the line first. So the first robot is from the community, it doesn't have an owner, what if it goes first, is that okay? Participant 3: What do you mean with the community? So it's from the city, from the government. Participant 5: So if it wants to buy a bread for the community..? Participant 1: Maybe if he's hungry? I: No let's say you are in the governmental home, say he needs to arrange something and he needs to be in the same room, than he can go first. Participant 1: yeah, it is hard to imagine what the robot can pick up, because for everything that is digital I don't see why a robot should be in line, Participant 5: yeah, Participant 1: I don't see what that robot could carry that is not digital, so I am not really sure in what cases this would be used. I: I understand, so it would be ownership then.

Participant 5: If the robot would.. Participant 1: if the robots would buy train tickets, then it buys train tickets digitally. Participant 5: yeah, true. But if the owner or robot takes zero time to get what he wants at the desk, than it doesn't matter. Participant 1: But it never takes zero time, Participant 5: no 1 second, if it would just like 'boem' and then he goes, Participant 1: well

I can see why they would come up with this rule, like robots can go first, but then what if eventually there would be like 20 robots before your turn, Participant 5: yeah then you have to eh wait, maybe you would have like baseball bets at some point to smash robots or something, like make it a game, haha, noo..

Participant 1: someone will get really mad

Participant 5: I agree that these robots don't look like they can carry anything, Participant 1: yeah,

Participant 5: Is it a light on top? I: I don't know,

Participant 5: maybe they can be, oh no they have lights there. Maybe they are these robots that go first in line to buy Madonna tickets before you can.

Participant 5: Wauw Participant 1: Then I will beat them, then they would not go first Participant 5: Why would they buy tickets in a physical place? They will go in a digital line, Participant 1: I heard that they want to go back in selling tickets at a postal office, because digitally there is a lot of hacking going on.

-- Talking through each other for brief moment --

I: What do you think Participant 3?

Participant 3: I would use a robot if I can avoid it to wait in line. So then I, honestly, I, if this is a case, I don't care if the robot has to wait, it is his job, so I don't have to stand in the line and to wait, in that case it is efficient for me, because I use it, maybe it is not efficient for the other customers, maybe it is not efficient for the shop by itself.. but if I am the owner of the robot and I just command my robot to go and to buy something, it is okay. If I am in a shop and I see many robots and they would just skip the line, because they are robots, than it is something I wouldn't like. If there is one line with robots and one line with humans, maybe I would start thinking to buy a robot.

Participant 1: the overall thing with all three examples is that ehm, we all care about humans but we don't care what a robot thinks or feels or whatever because we don't.. because now they don't have thoughts or emotions.

I: yeah good, last example, let's imagine that these things could talk around without humans knowing it?

Participant 5: What would they talk about?

I: yeah imagine they could, indeed, now they just practical, they communicate practical stuff and data, what if they could communicate what they think or what they would rather do?

Participant 4: then we understand what they are saying

I: Yes, should we always know or understand what they say? Or will they be able to go on their own? I don't know if you have heard about the Facebook computers that have their communication at a certain moment?

Participant 1: Yeah it is a scary thing, because I think as a human you want to have control at some sort of way, on the other hand it will go so incredibly fast that you cannot follow everything. Participant 5: Would you be able to hear, not to understand, but notice that they are communicating?

I: Do you think it should?

Participant 5: Ehm, I think if you are not able to hear them, or notice that they are communicating, then I don't think, yeah.. okay, please go ahead

Participant 1: maybe they are calling all other robot friends to bug you in the park

Participant 5: Yeah but it is similar to, maybe people sitting in the space chatting with each other, Participant 2 and Participant 1: yeah, Participant 5: or (..) with each other and you don't know that they are communicating, you see they are busy with something but you don't know if they are checking Facebook or if they are sending a message to the other person.. Yeah.. and even if you would be able to hear that they are talking to each other, see that they are blinking lights or whatever, yeah.. In Amsterdam there's a lot of people talking in languages I don't know, and should I be intimidated by that? Or?

Participant 1: I think in the end we should be able to trust whatever they are communicating, Participant 5: yeah, Participant 1: if you want robots to help us, Participant 5: I wouldn't think they were gossiping about us, or would think of evil plans they would do with humans, there should be a trust thing, Participant 1: what if it can be hacked? Participant 5: True, Participant 1: By evil humans, Participant 5: no they cannot be hacked

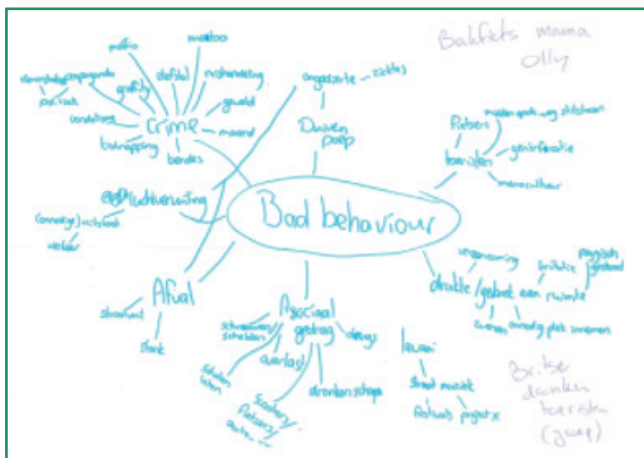
Participant 3: I am thinking what kind of information they can exchange, I don't know if I think for example if I have my robot and I need to buy bread and flowers, if the robots can communicate with each other on a medium-long distance, so my robot knows how many other robots are in the shops, if the shops are really buys, then the robot can decide by himself: what is the most efficient way to go? First the bread and then the flower? Or maybe first the flower than the bread? Then maybe the communication is okay, it's helpful. If the robot start to send each other, euh, I don't know for example locations, what you are buying and when you do it, what kind of system, I don't know, that you use to pay, all this information can be critical information that can also be used against us, and this is something, I don't like it. I would like, okay for me at least, it's okay if they communicate, but I would like to know: what kind of information? What kind of data? And especially: how data is used. They can even share this data if it's okay, it is okay if I say it is okay, if it is for me a reasonable way to share data then it is okay. If, again, if it's an open system, if I am not aware of what is exactly happening, then it's something I wouldn't like. In this case, for me it is about awareness.

8.4 MATERIALS OF THE CREATIVE SESSION TO CREATE BEHAVIOR FOR A THING

GROUP 1 - BAD BEHAVIOR

Mindmap

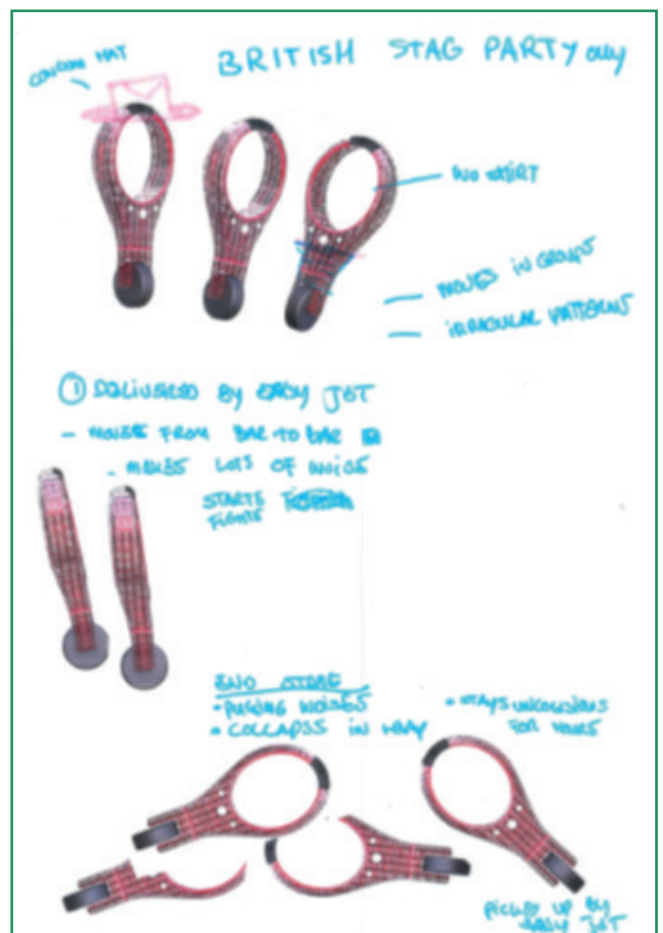
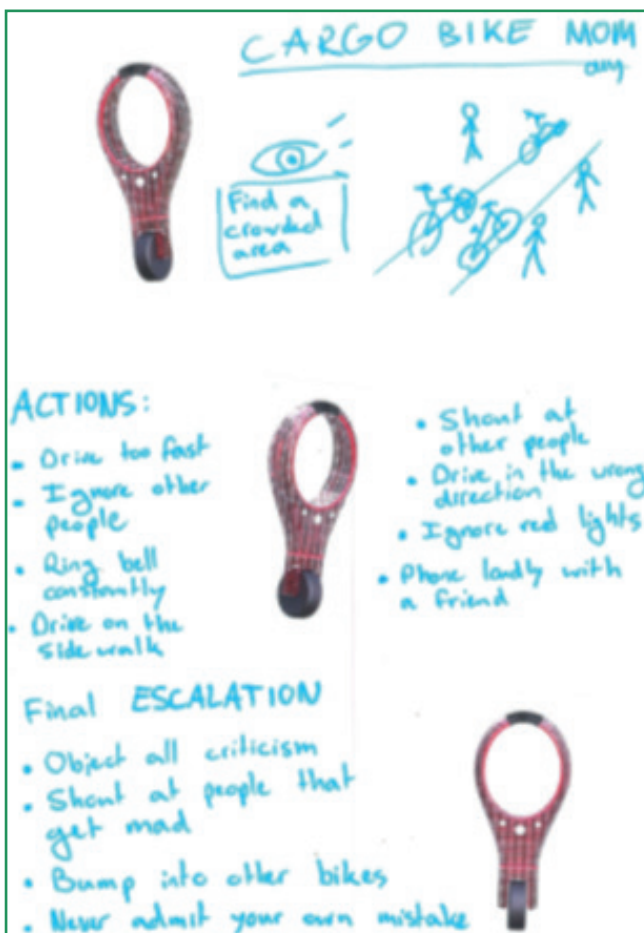
The mindmap mainly shows property values, how public spaces need to be respected: about the trash in the streets as well as unwelcome group behavior in crowded places. Moreover it describes crime from extremes (kidnapping) to small ones (thieves and graffiti). Notoriously they see demonstrations and propaganda as crimes too.



Storyboards

1. This storyboard describes the Olly as a Cargo Bike mom. It finds a crowded place and starts to interrupt other people by: driving too fast, ignoring other people, ignoring red lights, etcetera. The story describes a final escalation whereby they describe that Olly would object all criticism and will never admits its own mistakes.

2. This storyboard describes the Ollys as british stag party group. It is mainly about Ollys being portrayed as Things that bother and stand in the way, rather than adding value to society.

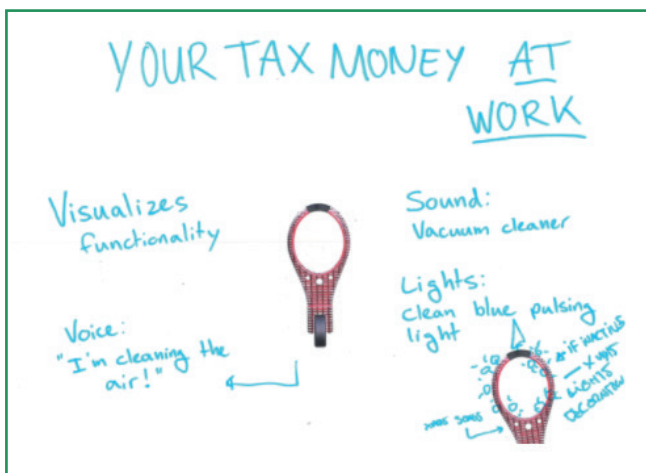
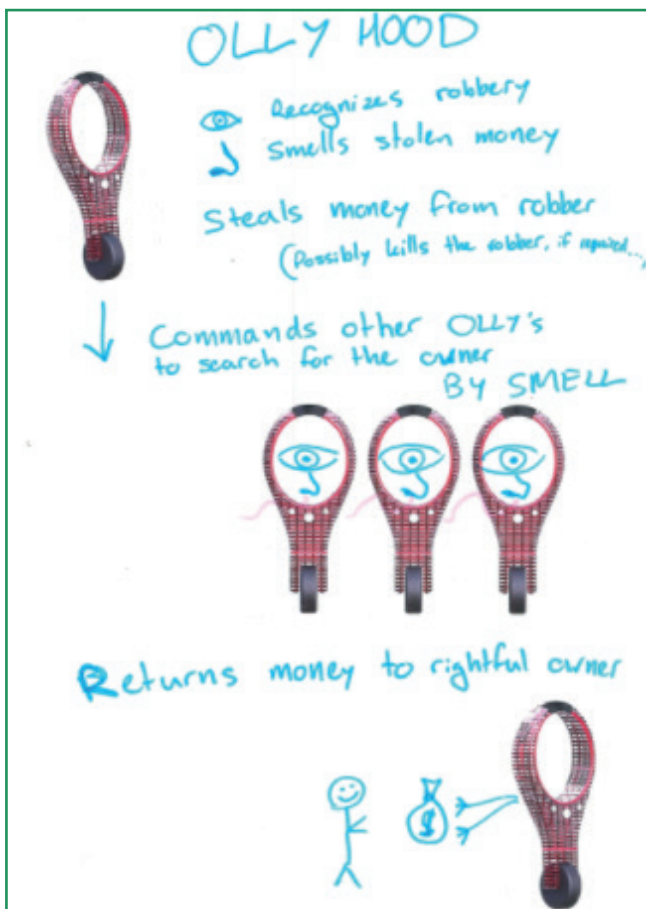


GROUP 1 - GOOD BEHAVIOR

Storyboards

Storyboard 1: In this storyboard, the Ollys are superheroes that use their smell to recognize robbery. It is about Things promoting and acting in fairness and property.

Storyboard 2: This storyboard is called 'Your tax money at work'. The thought behind it is that often people doubt whether bureaucrats do their job well as you invest in them with your tax money. So that could be the same for Things, they should show that they are worth the tax money. In the storyboard they do it by making vacuum cleaner sounds and reporting by sound that the air in an environment is cleaned. When not in use, they would turn into christmas lights as a decoration of the street.



GROUP 2 - BAD BEHAVIOR

Mindmap

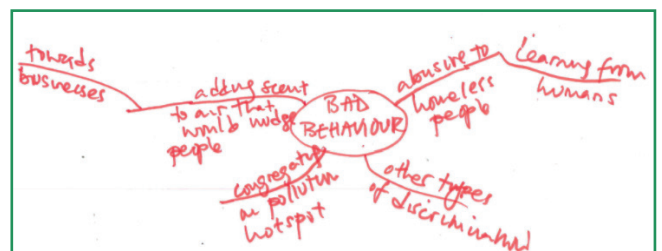
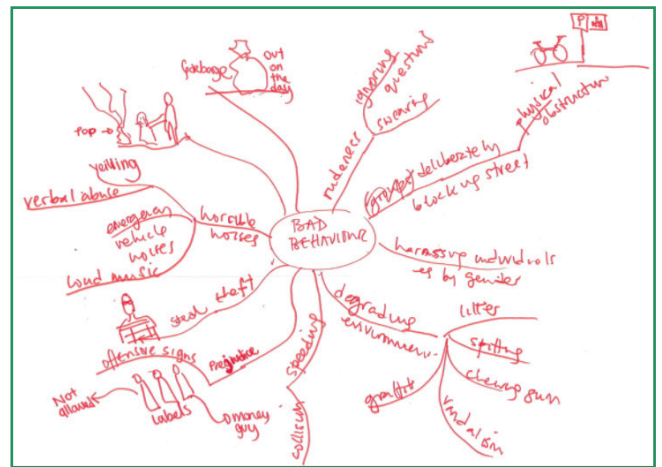
This group has included in the mindmap discrimination (offensive signs, prejudice, harassing by gender). They also describe degrading the environment by noises or trash (vandalism) or blocking the ways. Moreover, they note out ignoring gestures as being rude.

Storyboards

Storyboard 1: A person is driving in the car that has a lot of gas emissions. An Ollie notices that he can't do the job on its own and it calls for other Ollies to help with the job. The other Ollies go after the car to clean up the air, the result is that it becomes a sort of public shaming as the Ollies are after you (moral shaming for the driver).

Then after driving, the Ollie will punish the driver to make him aware of the pollution by emitting the bad air that was collected while cleaning up behind the car, the person is not allowed anymore and his air will not be cleaned.

Storyboard 2: The second story is about extortion by the Mafia, the Ollies can demand bitcoins by blocking the way of the driver and threatening the driver with its life.

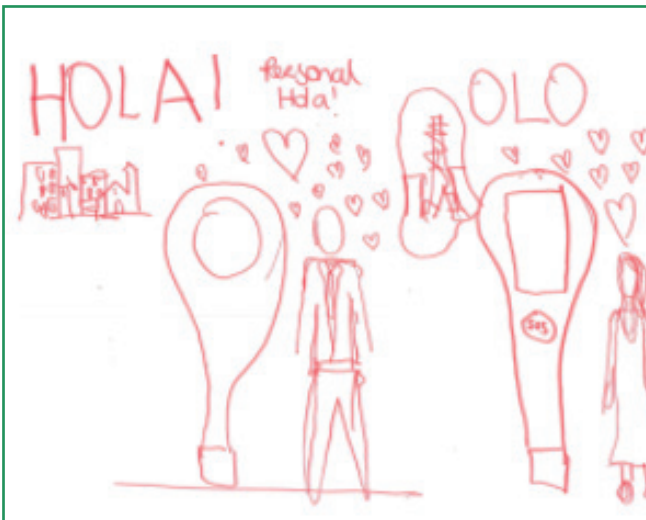
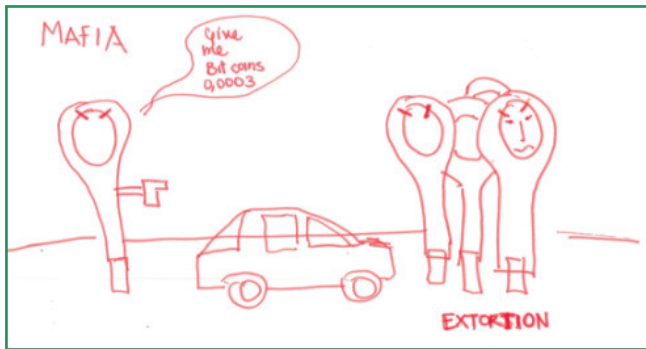
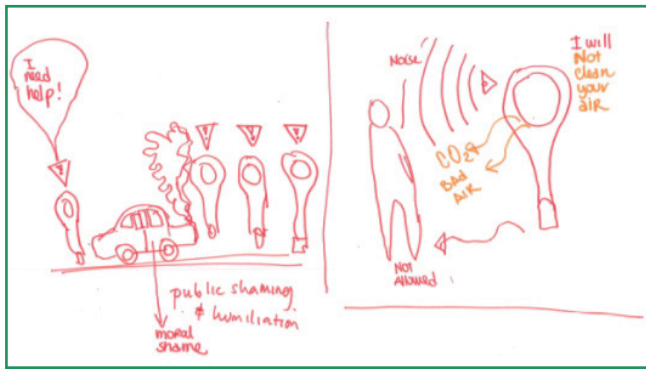


GROUP 2 - GOOD BEHAVIOR

Storyboards

Storyboard 1: The Ollys are now personal, they can adapt the smell of the air for you and adapt to your memories. They can for example give you the right smell at work that makes you increase your performance while offering a cup of coffee. The Olly is here portrayed as a servant.

Storyboard 2: The Olly can become a transport means too, because why would it only clean the air if it has all this capacities in it? The Olly can take you out of the polluted city to good clean environments.



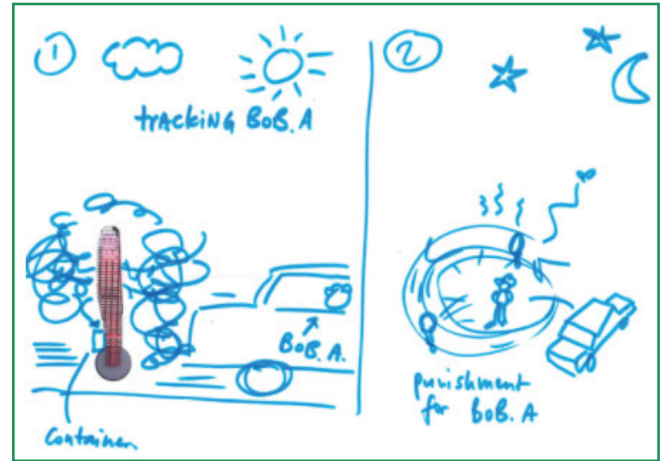
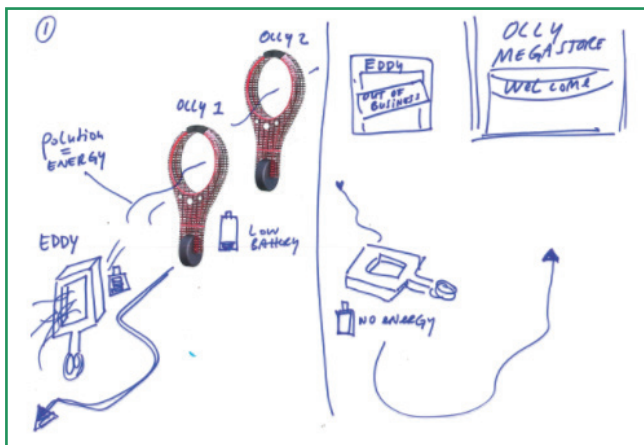
GROUP 3 - BAD BEHAVIOR

Mindmap

This mindmap is already made. Questions about responsibilities (unclear who the owner is), doesn't obey the law, conflict with other machines or competition, disturbs people in traffic and situations and disrespects the public environment.

Storyboards

Storyboard 1: In this first scene, Olly plugs out the electricity of another air purifier Eddy, because it is polluting as it is using energy. Because of the low battery, Eddy will fall out. It gives the Ollys the ability to reign over the neighborhood to clean the air. Therefore, the Eddy store is out of business and Olly becomes a mega store. (cheating, not fair)
 Storyboard 2: The Olly starts to run after Bob A. and is tracking him because his car is polluting the air too much. At arrival, the Ollys emit the collected air pollution of the air in front of his house as a punishment.



GROUP 3 - GOOD BEHAVIOR

Mindmap

The mindmap for good behavior focuses on Olly being an open system which everyone can benefit from. It has an open data source, shares its energy and it works for free. It has become a multifunctional tool and it also intends to help people on the streets with a friendly character.

Storyboards

Storyboard 1: Olly helps out the whole day long and carries groceries and helps the elderly cross the street. He also helps planning the route and prevents people from killing themselves. As a driving Thing, Olly can help out in so many more ways.



GROUP 4 - BAD BEHAVIOR

Mindmap

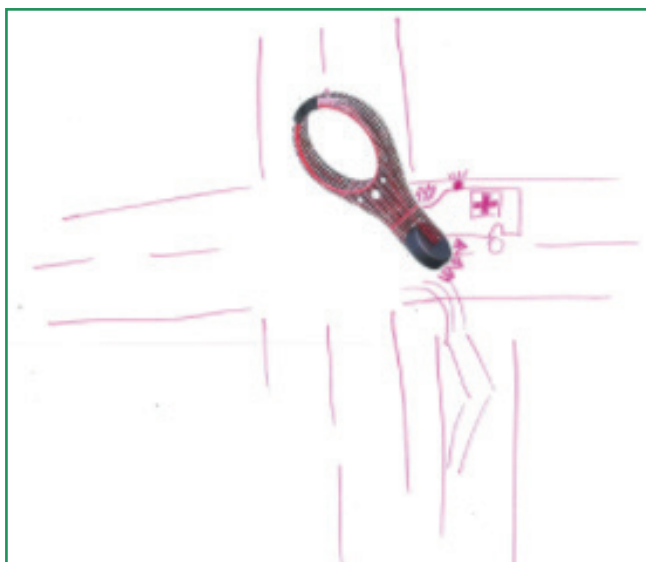
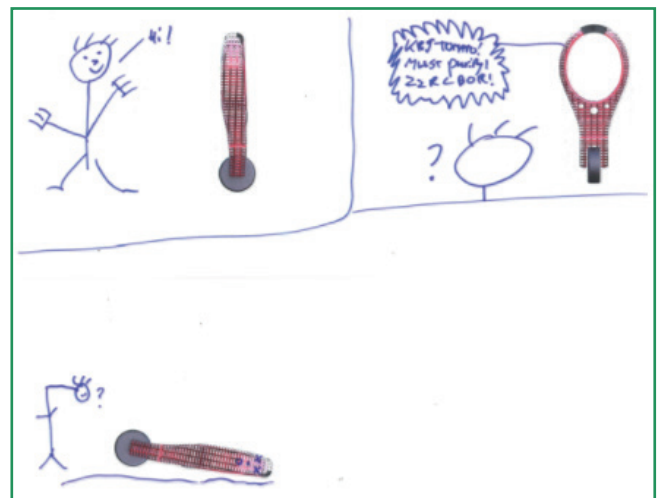
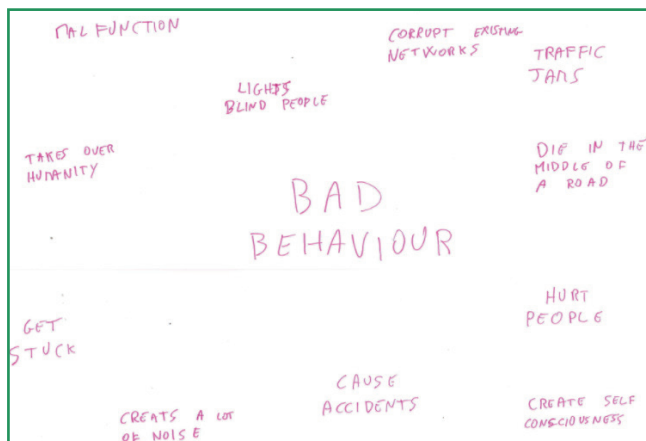
This mindmap focuses on the behavior for the Thing directly, it discusses bad behavior as the Thing being a physical obstacle in the city (noises, accidents, traffic jams, lights blind people) or being a threat to people (corrupt networks, creating self consciousness, takes over humanity).

Storyboards

First storyboard: Olly drives on the road and crashes into an ambulance as it is not watching out for the other traffic on the road.

Second storyboard: Olly drives on the road and has no intention to take into account other citizens. It demands that all citizens should get out of his way.

Storyboard 3: The Olly is talking to another person and suddenly crashes and falls down, not leaving any message about what happened.



GROUP 4- GOOD BEHAVIOR

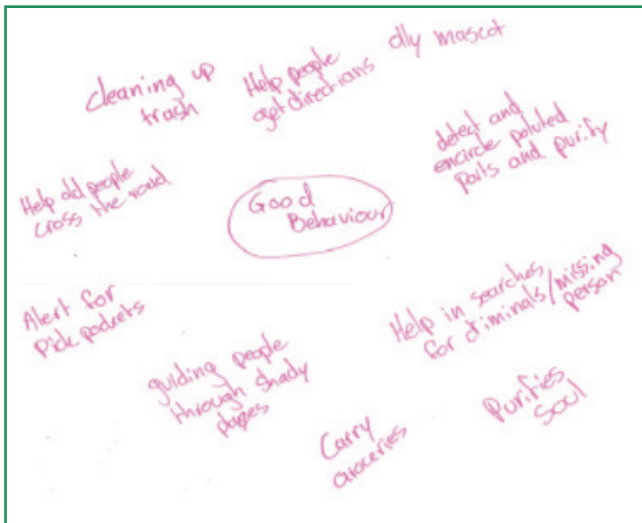
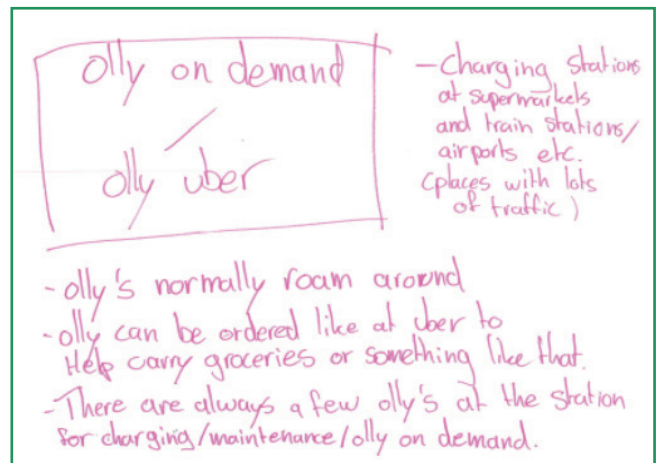
Mindmap

Mindmap good behavior: Examples of ways that an Olly could help out citizens, also out of the scope of air purification.

Storyboards

Storyboard 1 and 2: Olly is helping citizens to carry groceries and to light the way when citizens walk in the dark.

In order for Ollys to really help out, there will be an Olly on demand service. The Ollys can be ordered like an Uber.



GROUP 5 - BAD BEHAVIOR

Mindmap

Lying, Punish, paying, privacy, rude, kill or wound, being an obstacle, steal

Storyboards

Storyboard 1: Olly detects a smog area and decides to evacuate the citizens to protect them. He starts moving around asking to citizens to move out of the zone and helps them to do so. He uses face recognition to detect the citizens. Meanwhile, with his face recognition, he does not see a man with a beard, and therefore forgets the man with the beard.

Storyboard 2: In this story, Olly detects a person that proudly posted a picture of his new car. Olly detects the person with facial recognition and sees this as an opportunity for public shaming. It starts to follow the person and calling him names, after Olly even collects other people and shouts to them how bad the person is.





GROUP 4- GOOD BEHAVIOR

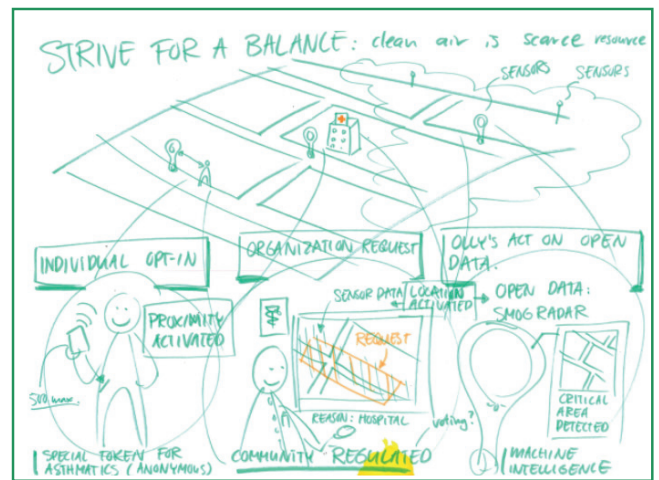
Mindmap

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Storyboards

Storyboard 1 and 2: Olly is helping citizens to carry groceries and to light the way when citizens walk in the dark.

In order for Ollys to really help out, there will be an Olly on demand service. The Ollys can be ordered like an Uber.



8.5 IDEATION FOR DESIGN CRITERIA FOR THINGS IN THE CITY

8.5.1 OBJECTIVE

The goal of this research is to discover design criteria for Things in the city. The results will be used as an inspiration to come up with design qualities for Things as citizens in the city.

8.5.2 METHOD

Participants

Five participants are selected for this creative session. The participants are master IDE students, as they have experience in Industrial Design and in ideation.

Structure

The method How Can You..? is used in order to generate ideas. For this method, participants ideate individually on their own sheet, by writing as much ideas on post-its as possible and by collecting these post-its on their sheet. They will ideate on a question that is displayed on the screen. For this session, three questions were asked, that were based upon the tables of the democratic citizenship model:

1. How can humans and Things collaborate as equals?
2. How do you create the feeling that both human and Thing are in control?
3. How does a Thing represent that it thinks for itself?

In order to help participants, they will get a specific design case to ideate for (see Material).

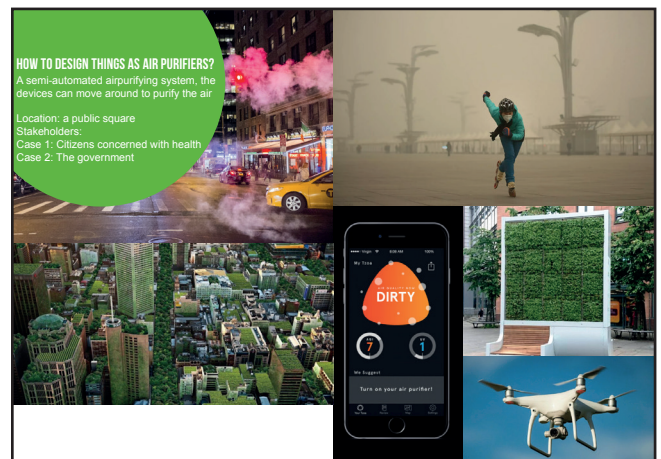
The participants get each a design case and three minutes to answer a question for that design case. After the three minutes, participants will switch from design case and try to ideate for the same question on the screen again, but then for the new design case. For each question on the screen, the participants got to ideate for each design case; so the participants had 5x3 minutes for each question on the screen. This way, participants will look at each question from different views and will not ideate for just one type of Thing specifically.

The ideas are clustered with the participants together, to create groups of ideas that cover a certain theme.

Material

As described in Structure, five different design cases will be introduced to the participants for the ideation. The five design cases are about a Thing that can act. Images are provided to inspire the participants during their ideation. The design cases are as follows:

1. Drivers
2. Gardeners
3. Ambulances
4. Air purifiers
5. Cleaners





Measuring

The ideas will be clustered with the participants during the session to get an idea of their perspective. Later, the ideas will be clustered again to make the results viable for the study.

8.5.3 RESULTS

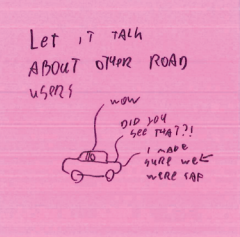
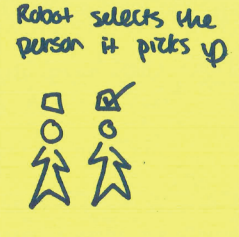
The results after clustering are shown on the following pages.

Add Human-like qualities

- Ability of caring
 - Surveilling safety robot checks if everyone is ok. 
 - It waits for you
 - Robots ALSO STAND AROUND AND WAIT 
 - Robot sings you a song to make you feel better 
 - request a certain smell. maybe some robots have 'smell personalities' 

- Social features - communication
 - make awkward small talk
 - just like real taxi drivers
 - explain issues in human terms - available - ^{with rap}
 - Talking car  Provides the passengers with information about the route.
 - Easy ^{for us well the thing as human} approachable, no boarders 
- Rights
 - prevent human vandalism somehow (AI self defence causes?) 
 - Same area  - same height
 - no separation same eye level 

Things can have an opinion (about human behavior) and act upon it

- Let it talk ABOUT OTHER ROAD USERS 
- Robot selects the person it picks up 
- Robot can kick out passengers who ~~behave~~ act poorly
- Robots rate areas based on cleanliness
- Robots can refuse to go to areas which are not clean enough

Let users treat them as living beings / create empathy

• Help them out

send emergency help to robots when they need it



• appreciate

People can send robots thank-you cards



• nurse / transform



The thing works as a tree.
We take care of it and the thing purifies our air.

It becomes more beautiful and better working, if we care well for it

override

The robot chooses how much the air needs to be cleaned, but if you do not agree with that, you can override settings

emergency situation override

I got sick and the ambulance robot doesn't show up. I need speed boost & get me to the hospital!

You can give robot suggestions



Suggest

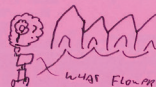
picking up extra passengers → user should decide

(no match-making business!)

user selects the type of car that picks them up

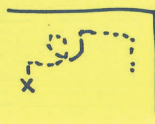


crowd source new plants / flowers



what flower do you want? show me what you like

user can select the route the robot drives



WHAT IS TRASH?
is there trash in the garden?
REMOVE ALL DISORDERLY FROM GARDENS?

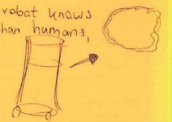
what we want
CLEAR | DIRTY

taxi can suggest several optimized routes
(shortest, fastest, cheapest, tasteische route)
user decides

automated

Program it so that it drives towards the most polluted area.

If the robot knows more than humans, it can decide.



autopilot mode

it can do routine tasks itself. when encountering anomalies, alert humans

(air purification)
in this case I don't mind the robots being in control. Just make sure they can't be hacked (see Black Mirror)

Robot adjusts and atmosphere in car to your mood and time of the day

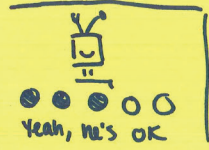
Involve/empower citizens

• voting/rating

People vote on which robots are in public service



Robot profile rated by other users



Advertise success rate

Respect other citizens

Ask people remaining if they are on with the noise

- it should not bother uninvolved citizens



• if they don't want to be involved

Ask for informed consent

Some people want 'OO's BEVIVE ME AR-AG-OS'

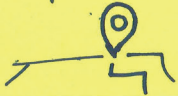
CHASE IT AWAY



citizens

- know where they are

Robot/user can let others know where they are



User keeps track of the route the robot is taking

screen that shows route



map of where all robots are



Before action - agree

AI PARLAMENT
VOTE FOR YOUR PREFERRED CONTROL SYSTEM

- users have influence

The robot should prove we can trust it

- prove of trustful behavior

predefined limitations - predictability

It has really specific tasks, it has its borders

agreement

Robot constitution



You and the robot sign a contract, so you both know the rules



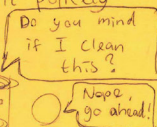
The robot and the (human) both have a specific role (like a chief and its assistants)

Expectation management (what can you expect from the robot)

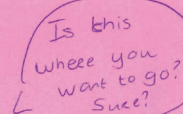
They do not have the ability to change how they are programmed

validation (when not in agreement)

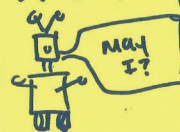
Ask it politely



It asks questions



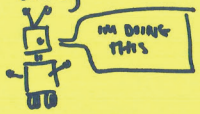


Robot asks permission before acting





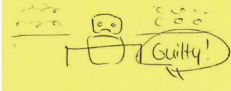
You need to provide the thing permission for everything it wants to do

It is limited to a certain task

During action-transparency / common ground

<p>Robot tells you what it is doing</p> 	<p>The robot displays 'its' tasks through a screen.</p> 	<p>People can see what the robot collects</p> 	<p>Robots can display info about air quality</p>
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After action-evaluation together / directability

<p>Evaluation moments, how are is the robot performing?</p>	<p>A report of everything the thing does is made up</p>	<p>• call for justice - who is responsible?</p>		
<p>The robot should show with data why it has made certain choices.</p> 	<p>defend its choices</p>	<p>Robot prison</p> 	<p>Robot court of justice?</p> 	<p>ROBOT ALSO WANTS TO SURVIVE</p>

Physical cancellation

<p>+1</p> <p>OFF There is a button to shut the robot down (just in case robots take over the world)</p>	<p>Button</p> 	<p>Be able to OVERPOWER IF ERROR (like elevator doors)</p>
<p>Shut down the robot if you disagree.</p> <p>ON/OFF Button</p> 	<p>You can slap it when it takes over.</p> <p>Bad Robot!</p> 	
<p>People can tell robots to go away</p>	<p>Emergency shut-off button</p> 	