L.A.M.A: MAKING DATA TANGIBLE FOR A MEANINGFUL DIALOGUE

Master thesis
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Master thesis
L.A.M.A. (Local Area Monitor Assistant): Making data tangible for a meaningful dialogue

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The project is the last chapter to wrap up my master degree in Strategic Product Design and represents the result of my journey of the past months. Within the project, a reflexion and a merge of my interest in visualisation, technology, psychology and love for data are present. I would like to thank everyone who gave support throughout the project.

I would like to thank my supervisory team for their support, feedback and learning experience. For example, my chair always stimulated to keep on questioning why and explain 'the why' to the reader to thereby make clear 'why' a particular aspect or step was taken. My mentor always made time to catch up and give good feedback and tips to support and inspire.

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Thank you all and please enjoy reading!

EXECUTIVE SUMMARY

Data has become an essential asset which grows and makes possible opportunities tangible to find and make an accurate forecast for future developments and vision more certain. The role of data is evolving and expanding, resulting in being utilized in open public databases. The main objective for making data accessible is to improve and further enhance the collaboration between the citizens and the municipality. This collaboration is an essential element in creating and optimizing a smart city. However, for all those that are not data literate nor see a meaningful use of data – these data remain a mystery, and further strengthening/improving collaboration by open data seems lost. This thesis aims to determine how data could support active citizens of Rotterdam to provide them with stimuli for direct collaboration with the municipality of Rotterdam.

In the first phase, Discover, the content of what is currently out there is explored. The city streets withhold a lot of data, information, knowledge, and history. This is one of the reasons, why open data needs to become more appealing and accessible to the public. Besides, a merger of big data (quantitative) (telling what is happening) and thick data (qualitative) (telling why it is happening) is necessary as the essence of the context is needed to make data understandable, clear and interpretable in the right way. To understand the data, the answers to how, what, where, who, when, what (1H5W) must be clear and known. Therefore, thoughts in mind, which are implicit, must become explicit to provide support for why something is communicated. Furthermore, visualising data makes it tangible to be understood by all citizens and reduces misinterpretations of what is communicated. Staying critical, discussing with others and evaluating can stimulate to translate knowledge into wisdom and create a correct perception. The understanding of what is communicated allows creating a common sense judgment. Making a diversity of people (citizens, organisations and, municipality) collect data can give a better perspective of the phenomena. Therefore, data must be stimulated to be used not only for the public but also for the employees of the Municipality of Rotterdam. As multiple study cases have shown, focus on a digital tool, like an application, is needed to make the data accessible to everyone.

All insights are gathered and a definition of the problem formulated. The main research question for the project is 'How can active citizens be supported by data to begin collaborating and share their initiatives with the municipality?'

During the Discover and Analyse phase, it was evealed that the problem was a lot broader than initially expected. This is the reason that an additional focus is made as the first step in making area networkers familiar with data before achieving the main goal. The process continues with deeper research on the area networkers and future trends. After this research, a design brief is created, and a value proposition is formulated: "Make data as tangible as 'Wikipedia' with the possibility for the area networker to find and add information to provide more comfort and control of data usage to optimize thereby the connection, understanding and easier delivering of support for their neighbourhood."

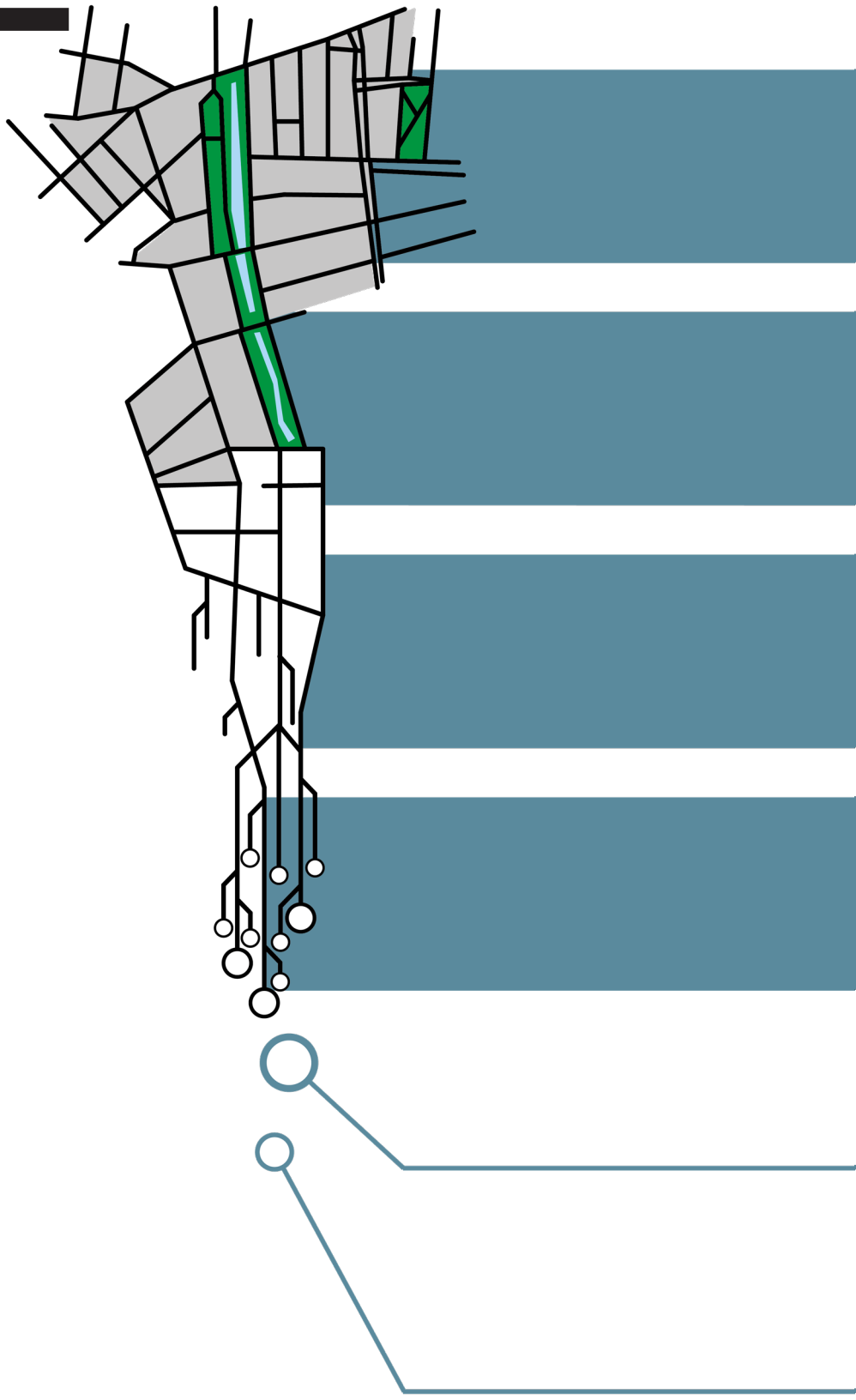
After an ideation and conceptualization phase, the final concept is created: L.A.M.A. which stands for Local Area Monitor Assistant. L.A.M.A. is an application which provides support to gain knowledge on observations in the neighbourhood for the area networker. The L.A.M.A. serves the area networker as an external hard drive. Not only does the increase of knowledge result in a better understanding of the neighbourhood, it also supports in getting a stronger connection with citizens. It furthermore allows optimization of the neighbourhood in a controlled and more comfortable way if it is supported with data.

L.A.M.A. makes collecting data approachable/ assessable by taking a photo of the captured data, since a picture says more than a thousand words. But to avoid any misunderstandings a label and additional notes can be added. By doing this, the phenomena becomes very visible and understandable for everyone. Besides having the ease of collecting the data, the user will learn to see the benefits of dashboards in giving knowledge and stimulate to make the next step.

An interactive prototype was developed to evaluate the application. Evaluation gave insights into the experience and usability of the application and resulted in optimising and improving some screens. Other results are taken in for the future development of a vision for 2036 translated into a roadmap.

A solid foundation is created, but further development and research are needed to realise the concept and to strengthen the collaboration between the citizens and municipality envisioned by using data.

TABLE OF CONTENT



INTRODUCTION

The potential of big data is enormous. When used correctly, big data provides insights that can radically improve decision making across organizations and communities. Another development is a new level of democracy which is taking shape, featuring a growing collaboration and interaction between politicians and citizens. By using analytics and new patterns, correlations can be found to optimise and assist in the decision-making processes. Visualisations can spur the dialogue and create a shared understanding (Berinato, 2016). Shared understanding leads to new ideas that solve existing and new societal problems (Dara-Abrams, 2014; Spool, 2012).

As the world of data is evolving, the field of data starts to expand to public use, utilizing public open databases. These open databases provide a vision of transparency and are available to access by anyone via the World Wide Web. However, for all those that are not data literate nor see a meaningful use of data – big data remains a mystery, and any prospect on decision-making support is lost.

This thesis aims to explore how data could start supporting active citizens to provide stimuli for direct collaboration with the municipality of Rotterdam. The project is part of the research project Open4Citizens that studies the meaningful use of open data to strengthen the collaboration between the citizens and municipality. The facility Industrial Design Engineering is one of the partners in the project Open4Citizens.

OPEN4CITIZENS

The open4citizens project is part of European Horizon 2020 CAPS (Collective Awareness Platforms for Sustainability and Social Innovation). The aim of 'Open4Citizens' is to stimulate to make meaningful use of open data and to strengthen the collaboration between the municipality and civil initiatives [1]. To realise the goal hackathons are being organised to bring experts, employees of the municipality and the citizens together to generate ideas in a co-design process to stimulate their collaboration. The output of the hackathons is to develop services to improve urban quality and certain aspects of the daily life of the citizens. In this way, the citizens become aware of what open data can offer them and create new opportunities to encounter their future city.

Currently, the project is running pilots in five cities: Copenhagen (DK), Karlstad (SE), Rotterdam (NL), Milano (IT) and Barcelona (ES). The Hackathon sessions in Rotterdam focus on urban services in public parks. These sessions are not only contributing to better collaboration between the municipality and the citizens; they also encourage citizens to become more active and involved in the development and future of their city, and likely more data literate. One of the critical issues regarding the hackathon is that while active citizens are willing to act, they still find it challenging to gather proof and support for their initiatives. Besides, they feel that they are not confident enough on the subject to share their initiatives.

It is foreseen that citizens can use public databases to search for data to support their initiatives. This data can be used to justify the need for development and ideally contribute to a sustained proposal to persuade the municipality to invest. It turns out to be an issue since the citizens find it hard to share their initiatives and thereby start collaborating with the municipality. The project will focus on supporting the civil initiatives to begin creating a solid case with data and thus translate this into a convincing and robust dialogue between the citizens and municipality. The project will focus on the group of citizens who are committed and have the passion for taking part in developing their community and taking an initiative to collaborate. This group is referred to as 'active citizens.'

[1] http://open4citizens.eu/

ASSIGNMENT

It is clear that current open databases, which can provide support for initiatives, are not accessible or attractive to explore for everyone. There is a lack of understanding of the currently available databases and context of data itself, which makes it less attractive and very time consuming to dive into further. Thus, finding the data/information to create proper evidence, which provides a good foundation of support for their initiatives, is hard to achieve. This is the key problem of the project: how is the data communicated. Therefore, the current graduation project starts from the following practical main research question:

How can active citizens be supported by data to begin collaborating and share their initiatives? (With the municipality)

The main research question is divided into five-sub research question:

- What is the word 'data' referring to within this project?
- How can data give support to the active citizens?
- How to create a shared understanding?
- How to share an initiative with the municipality?
- Why does the municipality want to collaborate with citizens, and how?

The communication of data should be clear, accessible and attractive to use for the active citizens. Therefore, a tool will be created and this will give active citizens confidence and belief that they are able to explore data and apply it for possible initiatives. The data and context will be visualised in a form, which is understandable for the active citizen and enables them to have a meaningful dialogue to gain further support for their initiatives from the municipality. The tool will result in a lower threshold to create an understandable, solid and proper foundation of support for the active citizens' initiatives. Furthermore, it will strengthen the collaboration between the active citizens and the municipality.

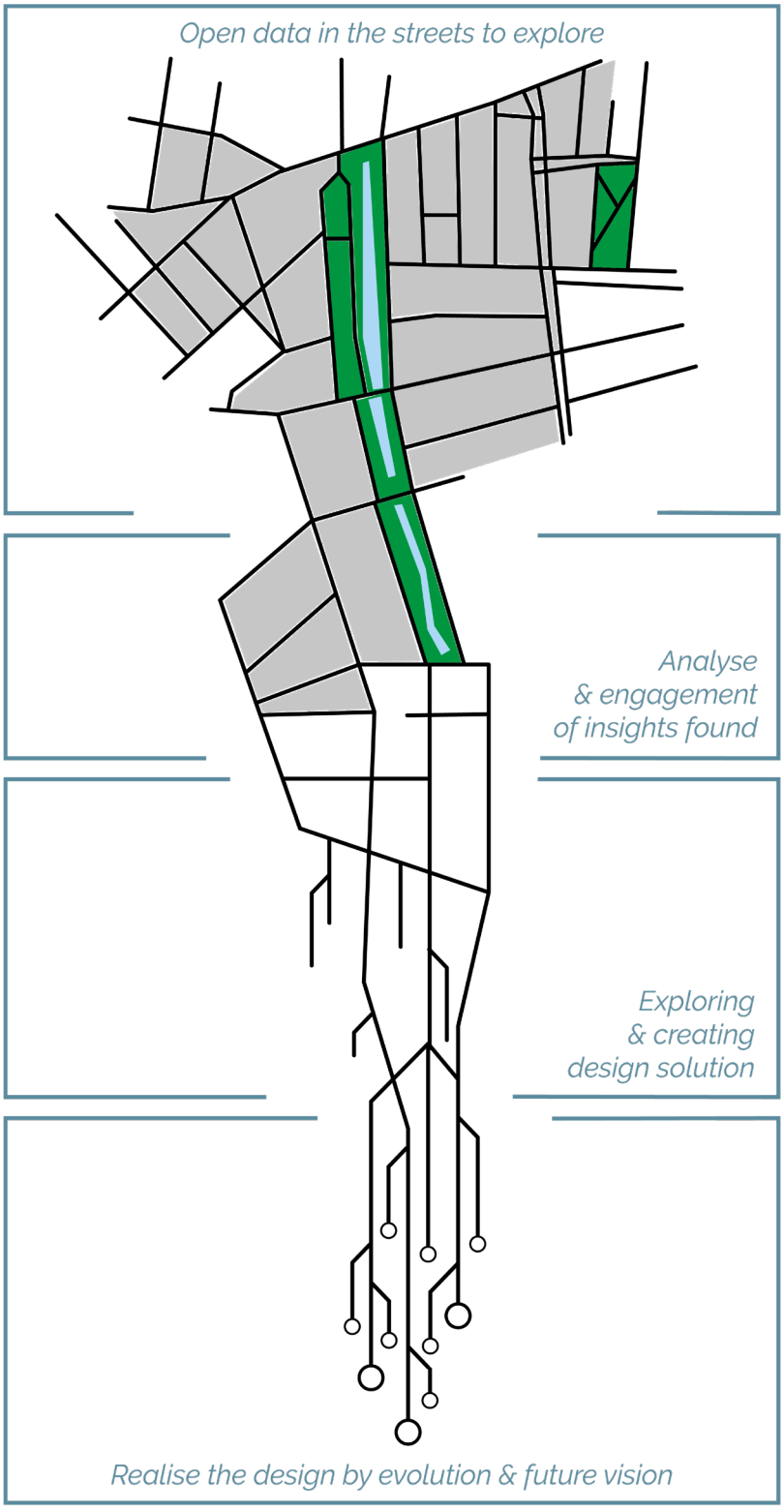

Open data in the streets to explore
Analyse
& engagement
of insights found
Exploring
& creating
design solution
Realise the design by evolution & future vision

Figure 1

APPROACH

The project report will consist of four main chapters besides an introduction and a conclusion. The four chapters represent the four phases: Discover, Analyse, Create and Realise (see figure 1 for an overview of phases and figure 2a, 2b, 2c and, 2d for more detailed images).

Figure 2a: Discover

In the first chapter, 'Discover,' the content of what is out there will be explored. As the city streets withhold a lot of data, information, knowledge, and history. An overview of the knowledge and details of the context creates a clear image to find and understand the main problem. In addition, in the chapter 'Discover,' the sub research questions will be answered.

Figure 2b: Analyse

In the chapter 'Analyse,' important knowledge and details from the chapter 'Discover' are being engaged in generating a problem definition and design brief. The 'Analyse' phase highlights the essential aspects which should be taken into account for the following phase

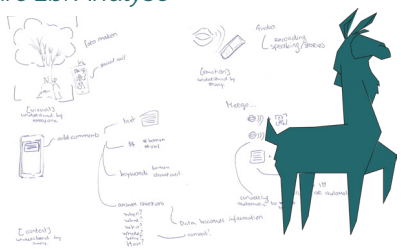


Figure 2c: Create

The third chapter, 'Create,' describes a concept proposal. This builds further on the 'Analyse' chapter output to create a good design which meets the criteria from the design brief.

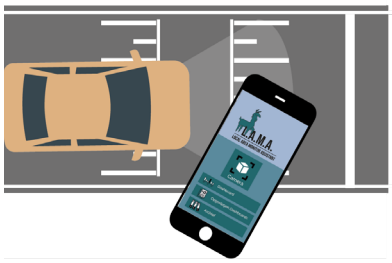
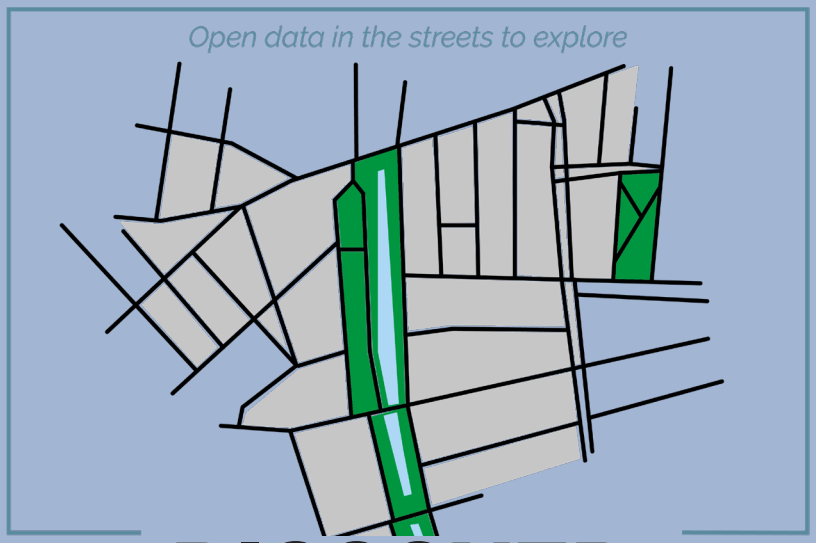


Figure 2d: Realise

The fourth chapter, 'Realise,' explains how the concept can be realised and more important, the implementation of it using the most effective approach.



DISCOVER

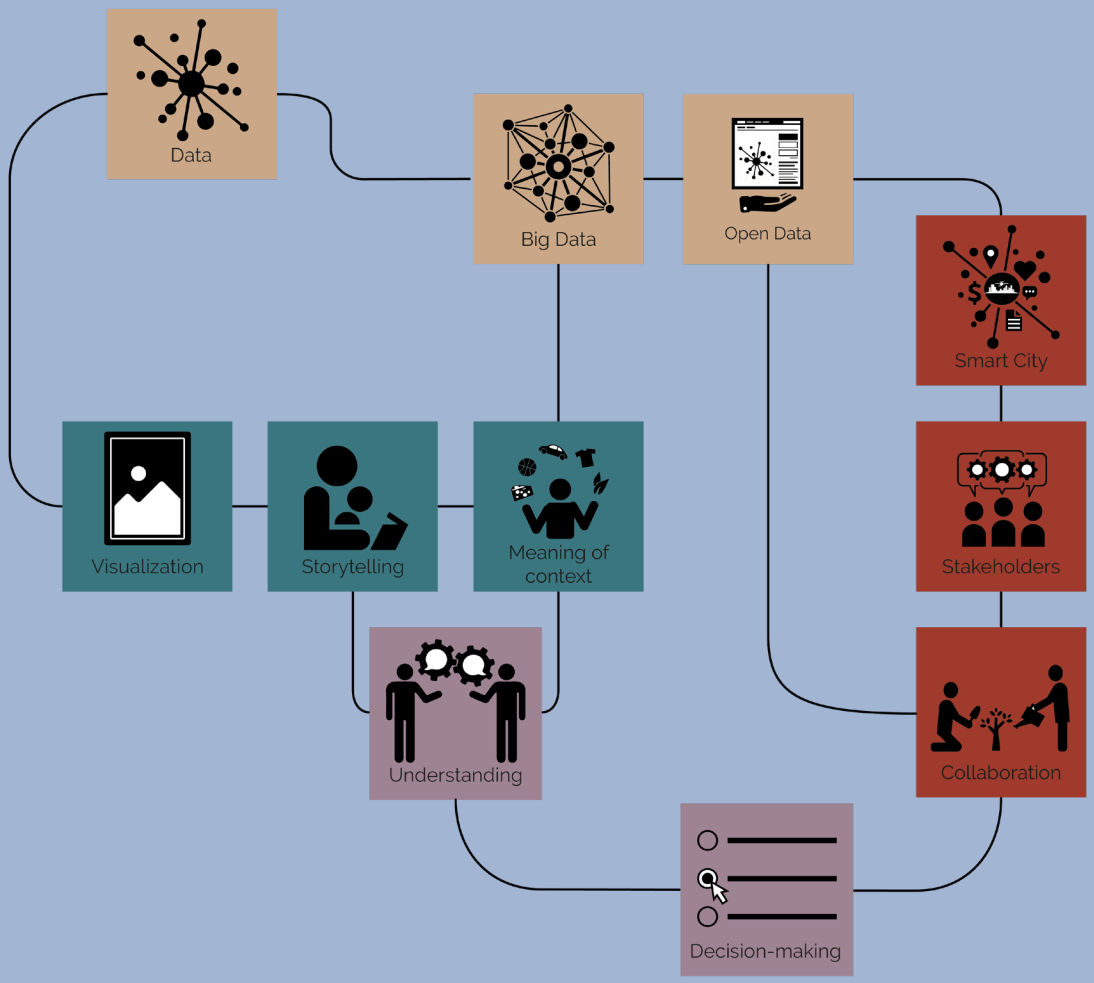


Figure 3

INTRODUCTION

The chapter 'Discover' contents of research of the context in line with the assignment. A deep dive has made into the context, whereby all kind of interesting things will shed light on to create a good overview of all the aspects the context holds to gain a platform to start making a design brief, which is found in the chapter 'Analyse.'

The situation has been visualised (see figure 3) to present an overview of all aspects involved, to oversee the context. The context for the platform consists of four topics: data (data, big data and, open data), forming meaning in communication (Visualisation, storytelling and, meaning of context), understanding and decision-making and, smart city development and collaboration (Smart city, stakeholders and, collaboration). The four topics contain different aspects, which are connected with each other (see figure 3).

Aspects that will be discussed are; big data, data Visualisation, decision-making process, understanding process, stakeholders and, the way their collaboration is evolving on the topic of urban innovation development.

DISCOVER

DATA

Data is considered as a broad dimension of an enormous variety of forms. Research is done to enlighten what data consist of, why data is essential for us, how it currently is applied in our daily life and, the validation of data. In the end, a conclusion is made containing the main insights to define what data will mean within this project at the end of this chapter, Discover.

WHAT IS BIG DATA?

People have always craved for prophecy, we all want to make the right decisions, so we gain for insurance as we in history used an oracle to answer this, today we are using big data (Wang, 2016 September)(more about the history of data, see appendix A1). Big data consist of extremely voluminous datasets, which are used to reveal new insights mainly about human behaviour and their interactions. These large datasets are made out of structured and unstructured data which needs to be processed using advanced analytics and Visualisation techniques to uncover hidden patterns and correlations. The output can then be used to optimise and improve the decision-making process or even create new opportunities.

There are three essential dimensions of big data, well known as the 3V's; Volume, Velocity, and Variety (Soubra, 2012; Wamba, 2015). The volume represents the size of data. The size of available data is exponentially growing, which makes it hard to keep up data storage. The social media company Facebook, for example, generates 10 Terabytes each day (Nasser, & Tariq, 2015). Velocity illustrates the speed of the data stream and the way it is processed. For a few years, datasets are growing so rapidly that it is getting harder to use the data or even start creating the right structure to make it tangible to use (LaValle, 2011). Variety shows the different formats of data. The structure of data has changed since the data can be anything (Gray, & Bjorklund, 2014) for example GPS, temperature, music, video, photos, and the number of hours studied or even someone's behaviour on the internet. Whereby current systems can process just a part.

It is evident that the three dimensions are becoming a challenge to manage (Nasser, 2015). As the demand of structured data and use of data sources is rising, new technologies are being developed to process data faster and to allow to dig deeper into the databases for more and better valuable insights (LaValle, 2011). Organisations try to make use of in/house available data, which is challenging due to the enormous amount of the data available as well as getting access to this data. If organisations succeed in overcoming the above thresholds, there are other essential aspects to manage; how to get a grip on it, how to find trends, patterns and associations primarily relating to human behaviour and interactions (Nasser, 2015). As a result, a limited number of people only use a small part of the data available.

CURRENT USE OF DATA

"The favourite pie for everyone in America is… apple pie! This is a fact since we can conclude this from data (sales etc.). But then the supermarkets decide to make a smaller pie suited for one person. Then all of a sudden apple pie is not the favourite anymore, because now you can choice your favourite without taking into account that everyone needs to like it" (Cukier, K., 2014).

This example shows the effect of the rise of data and the need for more since it allows us to see new, better and different insights than before. The new and rich data streams provide a way to tackle challenges in for example health care, environmental protection and urban planning (Morey, Forbath, & Schoop, 2015). In addition, sharing data with other stakeholders is becoming a new market to take part in, take the car service Uber, which is sharing their data with Boston officials to improve the transportation planning and prioritize road maintenance (Morey, Forbath, & Schoop, 2015).

The accessibility is slowly involving in the form of open databases, accessible for anyone to use. The public can start using this data and analyse it by themselves or can ask for help via the organisations who are providing the data.

The gap between usage and data still seems to be perceived as large, but actually, this is not entirely true. Although not everyone is realizing it, we are all applying data to our daily lives. As O'Neill (2016) explains:

"A model is nothing more than an abstract representation of some process, be it a baseball game, an oil company's supply chain, a foreign government's actions, or a movie theatre's attendance. Whether it's running in a computer program or in our head. The model takes what we know and uses it to predict responses in various situations."

As a mother, for example, makes dinner for her family, she makes use of her model to devise a meal to prepare. The input of the model is everyone's appetite, vary from day to day, budget, available ingredients, her own time, her energy level and cooking skills (O'Neil, 2016). The output of the model is what turns out to be the meal of that night. An evaluation is made of how much it pleased the family, what is left over and what her own opinion is about the meal, to update the model. This updating and apply for adjustments makes it a 'dynamic model' (O'Neil, 2016).

OPEN DATA

Since a couple of years, databases are starting to get more open to the public. These open datasets create more transparency mainly as a goal for the municipality (ICTU., 2018). The Dutch municipality finds it important to give the citizens, start-ups or even enterprises the chance to freely use these databases because it will enhance new opportunities and purposes (Nederlandse Overheid., 2017; NSOB., 2015). The databases can primarily be found on the Internet. Some examples of these databases, with a perspective towards the Rotterdam citizens, are; Gezondheidsatlas, Gesprek met de stad, Centraal Bureau voor Statistiek and Stadsarchief (more information about these open databases, see appendix A2).

BIG AND THICK DATA

Investments in the use of big data are common these days, but it turns out that not every single company gains profitable output (Asay, 2017; Informatica, & Capgemini., 2016; Wang, 2016 September). This is an interesting finding since data has always been a support to obtain insights and in decision-making. It appears that big data alone is not enough, knowing and including the context of it, is of great importance (Wang, 2016 September; Storey, 2016). Big data provides many insights, but it cannot explain motivations, the why, behind insights (Rasmussen, Hansen, 2015). As Wang (2016, September) gives a good example found in a Greek myth;

The Oracle, big data, did not stand alone to provide support in the decision-making process. She had help from temple guides who enlightened the context around the question to give an answer best suited.

This other data, the temple guides, is called ´thick´ data which cannot be quantified since it consists mainly out of observations, revealing the emotions, stories of the people and focus on only a small sample (Mindruta, 2014; Wang, 2016). It is essential to have a complete picture of the situation, to know the story of the ones involved and to make the right outcomes of the big data (Storey, 2016).

"Predict human behaviour is a continuous circle; Relying on big data alone increases the chance we will miss something, while giving us the illusion we know everything"
(Wang, T., 2016 September).

This conclusion of Wang (2016) was also encountered during a Hackathon organised by Open4citizens by a team. A team found a correlation assuming that Rotterdam citizens feel more fit and healthy if they live nearby the fast food restaurant KFC. This correlation is a rather strange conclusion and the chance that there is a

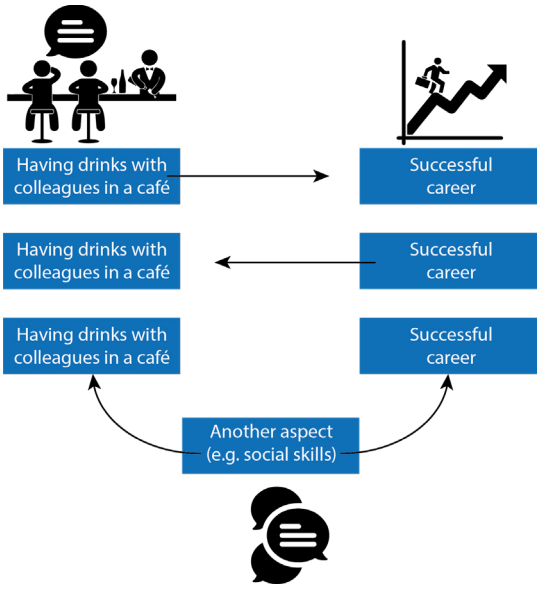


Figure 4

Figure 6a, 6b and, 6c

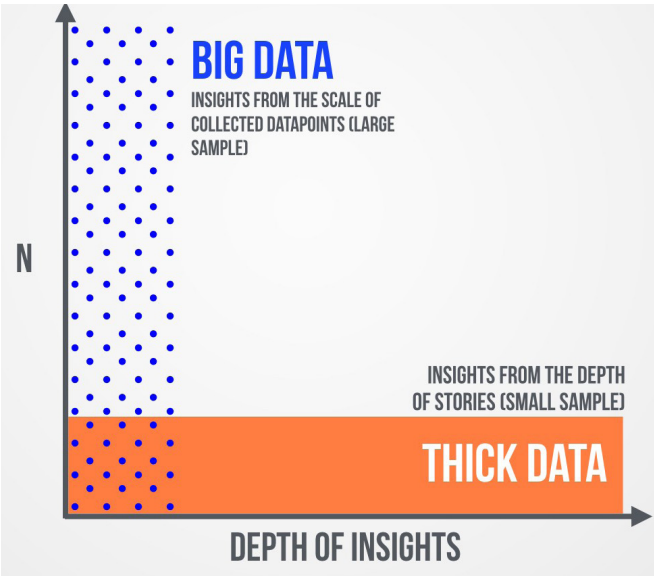


Figure 5

causation between these two aspects is unlikely. The participants used this rather odd outcome as an argument to apply 'local' data not quantitative only since this can result in false correlations and conclusions.

Besides, assuming to found a correlation does not directly mean causation (Gray, & Bjorklund, 2014). This can be explained in the following example; it has been assumed that those who often go out for social drinks with colleagues will have a more successful career. If the situation is visualised (see figure 4), it is clear that the causation can be either way or another aspect can be of influence, which makes both arguments not related causation at all. These are classic forms of a reasoning bias or a fallacy. They occur for example when an observer has an expectancy, and the participant will act differently to obtain the expected outcome. Another example is that the causation was valid in the past, but in the course of time has changed or is no longer there in the present. It is of high importance to always have a critical view of the outcome, in order to prevent this.

Both big data, quantitative, and thick data, qualitative, are promising to integrate to enrich the output. Whereby big data requires an enormous N to reveal new correlations and patterns as thick data requires a rather small N to reveal human-centred patterns in more detail (see figure 5) (Wang, 2016). Big data lose resolution, and thick data loses scale (for example see figure 6A (big data) and 6B (thick data)). For example, imagine you want to take a picture of a landscape for a poster to put up on a wall. To get a good picture, you want to use a wide lens with the right focus, so details can be seen and remain sharp. The big data provides this wide lens while the thick data provides a high resolution, together both aspects give a clear and detailed image of right insights to be found (see figure 6C). Combining both, big and thick data, creates an opportunity to find out what is happening by using big data and to explain why it is happing by applying thick data. As patterns, correlations and trends can be found with the big data, the thick data gives the explanation to get a real and reliable insight to support the decision-making process and provide a prolific output (Rasmussen, Hansen, 2015).

DATA

CONCLUSION

In addition, data gives insights and support for decision-making processes. The interest in data has always been there, as since the past we have been craving for prophecy, which data provides, as data gives us better, new and different insights. The data provides us information to get insights and finally gain knowledge out of it. The databases are growing bigger each day, resulting in big data, which makes having control over the data stream harder but in the same time give a more detailed perspective of the phenomena and the forecast of it in the future.

The world of data is developing, as data starts to be open to the public. Still, the public is not that willing to dive into the data as data is seen only for the people with a data or computer science background while everyone is using data in their daily life:

"All of us carry thousands of models in our heads. They tell us what to expect, and they guide our decisions."
(O'Neill, 2016)

These open databases provide a vision of transparency and trust and are available to access for anyone via the internet. In this way, the public is able to gain insights and create new opportunities by using and analysing the open databases.

Big data does not standalone; context is of high importance to interpret the data correctly. The context is also known as thick data, whereby big data and thick data are both needed to gain the best output. In short, big data represents what is happening and thick data shows why it is happening.

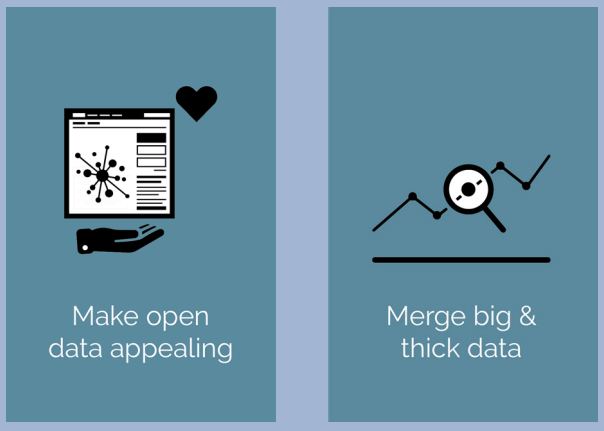
Many correlations are found in the big databases but should not be easily made and considered as the truth. It might look like that there is a relation but other aspects or variables could influences, be involved or are more in relation than the present

variables are. Thick data could give extra insights to provide a better and more logical explanation to the found correlations and thereby result in better assumptions and conclusions. Data has become open for public, but needs to become more tangible for the public to start making use of it. The asset, data, grows and makes possible opportunities become more tangible to find and make right forecasts for the future development and vision more certain. In addition, making the merge between big data and thick data is of high importance to understand the phenomena rightfully.

From the main insights of the research within the topic data, two questions are taken out (see below) which will be answered in the following parts.

How to make the context clear?
How to make data tangible by using visualization? (see form meaning in communication p.26)

Who to stimulate a critical view to make the right interpretation? (see decision-making & interpretation p.32)



FORMING MEANING IN COMMUNICATION

In this chapter, forming meaning in communication, topics that will be discussed are; the meaning of context, storytelling and, visualisation. These topics are all related to how data is explained and communicated to people and how people are able to understand what has been communicated.

THE MEANING OF CONTEXT

As mentioned in the paragraph about big and thick data, thick data represents the context, which is absolutely necessary for constructing the correct perception of the data. As Rendgen S. (2012) concludes:

"Awareness of the story behind the data is fundamental to have a real understanding of the phenomena."

The context is the key, which gives a more effective way of communication between the communicator and receiver by providing the background story to get more grip on understanding what is exactly communicated (Ashkenas, 2010; Essays, UK., 2013). In other words; the context *"shapes the meaning in all communication"* (Bradley, S., 2014).

Before one gives another his/her advice or opinion, clarifying the context and truthy understand the background provides a stable foundation to enhance his/her understanding and will result in a better and suited advice or opinion (Gascoigne, 2012). Asking questions as the temple guides did, is the easiest and best way to provide a good context to shed light on the background and thereby gain understanding of what is communicated and why. By repeating the answers of the conversation partner, one gives feedback to the other person there is a clear understanding. This feedback is important to avoid misunderstandings or implicit assumptions the mind might make.

If we look for more examples to emphasize the importance of the context, look at the following questions; why is Apple an innovative company and why was it Martin Luther King who led the civil rights movement? Why this company or man? The answer is quite simple, both give clear answers to the questions why, how and what (Sinek, 2009). The three questions are defined in a model called the Golden Circle (Sinek, 2009) (see figure 7). In short, it comes down to the fact that both Martin Luther King in the past and Apple today make it clear why they do something, how they do it and what they actually do.

By defining all these questions and sharing it, they made it clear what their context is and made an opportunity for anyone else to share this understanding and create empathy by doing so. The way you communicate is important to get through to somebody. Empathy makes people connect and therefore as Sinek (2009) concludes;

"People don't buy what you do; they buy why you do it."

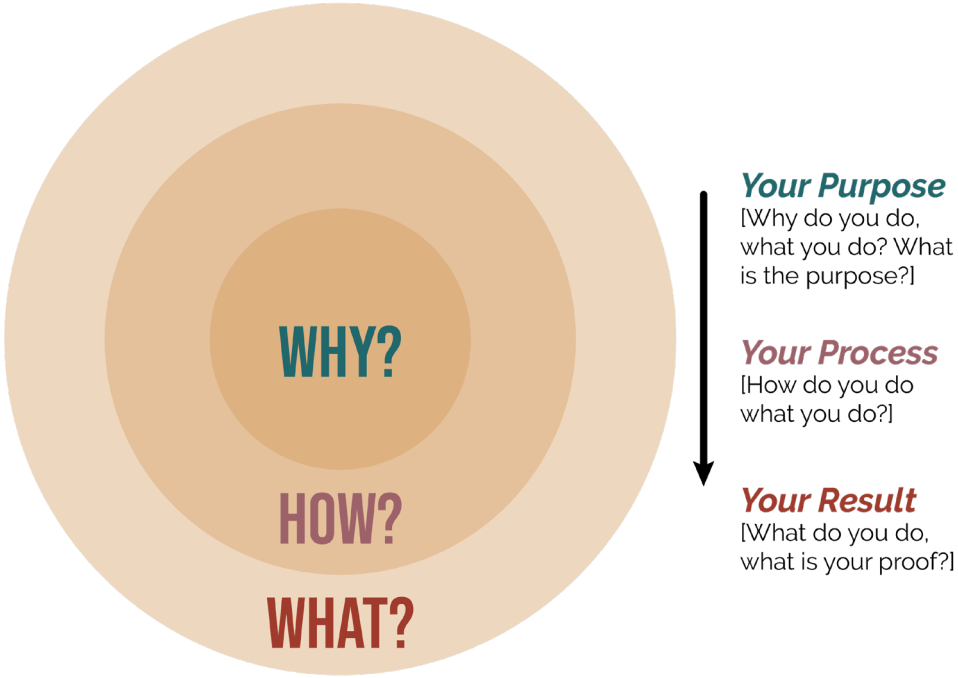


Figure 7

They all made their implicit thoughts explicit and brought it in an order that you first get to know why someone is doing what he/she is doing. Making a direct start by sharing the context first to stimulate a shared understanding as Sinek (2009) states;

"they all think, act and communicate from the inside out."

The context comes first in a clear and tangible way anyone directly understands and a shared understanding is created resulting in a connection (Sinek, 2009).

STORYTELLING

As Genauer (2017) states:

"Language was the first massive innovation driven by a need to organize, warehouse and distribute both functional and emotional information."

There is an emotional and biochemical reason why we prefer stories as a form of communication (Genauer, 2017). "Storytelling literally has a chemical effect on the brain that wakes it up in order to ingest, digest and store information"(Genauer, 2017). In addition, a story is one of the best communication methods to store information and remember (Trevino, 2017). All the stimuli of the brain activity by listening to a story results in an output of dopamine, which results in a reward-motivated behaviour of enjoyment (Genauer, 2017).

The emotional attractiveness allows the audience to be able to understand and identify themselves with the story (Davenport, 2013). By connecting with the story, the audience will remember the story easier. Stories are used to explain a detail better and making it more interesting (Analytics Vidhya., 2017). To accomplish this, it is important to know the target audience and understand their needs and interest (Berinato, 2016). The story must start with what audience needs to know about the story itself in order to allow the message within the story to be taken in by the audience (Davenport, 2013). Based on the knowledge of knowing the audience, the story can be suited to their field of interest to make the story attractive (Berinato S., 2016). Visuals can be used as a support to the highlights of the story in order to help remember them (Brenner, 2016). Different methodologies are being used, but one of the most important aspects is the essence of the story and why it is being shared with the audience (Davenport, 2013; Berinato, 2016).

VISUALISATION

The roots of Visualisation usage started already in the time that Chauvet cave paintings were made, which are undoubtedly the oldest attempts to communicate information in a visual form (Rendgen, Wiedemann, Ciuccarelli, Wurman, Rogers, & Holmes, 2012). Alongside the Chauvet cave paintings other mediums were used, as Berinato (2016) states:

"The first data Visualization was probably drawn in the dirt with a stick, when one hunter-gatherer scratched out a map for another hunter-gatherer to show where they could find food."

Visualisation is used to understand one another, as we are still using it today (more about the history of Visualisation, see appendix A3). Why is Visualisation so appealing and important to us? The answer is simple. It turns out that 25% to 40% of the human brain is concentrating on visual appearance (Gray, & Bjorklund, 2014). The human brain is consuming images faster than text or numbers, as colours and pictures are supporting this by allowing us to understand even faster what has been shown to us (Association analytics, 2018). Therefore, by making information visualised it makes the communication more attractive, as Osterwalder and Pigneur (2010) states;

"People react stronger to visuals and find it easier to interpret compared to text."

Furthermore, visual language is well known as a shared language, which is understood by everybody, no matter his or her origin. To relate the above to the subject of this thesis; the active citizens and Municipality might have an overlap in their knowledge, but different insights. Using visual data could help in getting shared insights. Fact is that the way the brain processes information making use of Visualisation is more effective and will help to get a grip on complex data than alternatively reading reports or spreadsheets (Berinato, 2016; Osterwalder, & Pigneur, 2010).

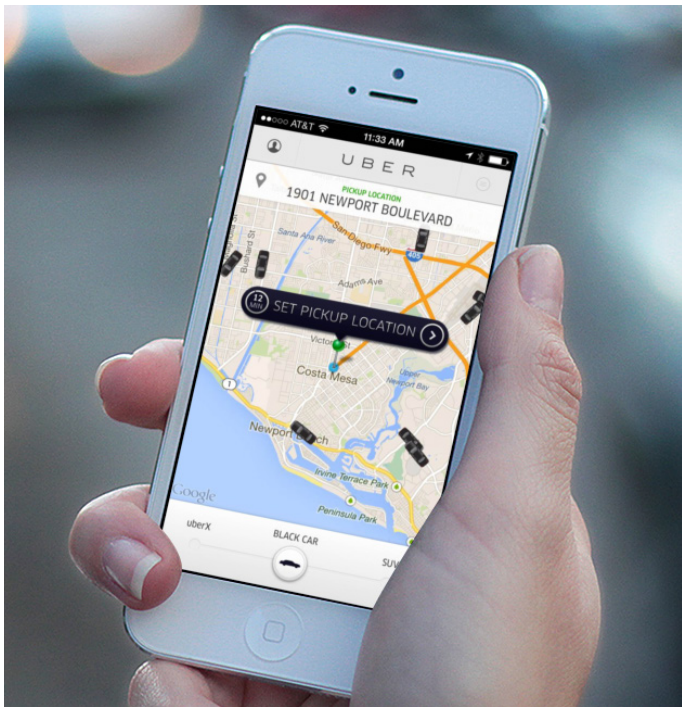


Figure 8

DATA VISUALISATION

Visualisation offers accessibility to make insights easier to understand regardless of the viewer's background and act upon it (LaValle, 2011). Data Visualisation is used in many different layers, whereby visualisation for public use is something rather ordinary. A few good examples are uber requests (see figure 8), weather forecasts, speedometers, google popular times (see figure 9) and, the use of the popular devices to measure our sleep, food, activity or exercise like 'Fitbit' (see figure 10).

Use of dashboards as part of business summaries is an indispensable part of supporting the gain of insights and make predictions to allow for better decision making.

Visualisation can have all kinds of different functions. Storytelling is a crucial part of the Visualisation since it should give support, to reveal a story but not be the storyteller itself (Stefaner, 2013). It is better to see the visual as a trigger of stories that will pop on the viewers' mind stimulated by looking at the visual. As the visual can steer the story that will be stimulated. According to Andy Kirk, there are mainly two types of Visualisation functions: exploratory and explanatory (Kirk, 2013). The first one, exploratory, creates an interface into a dataset or subject matter that aims to trigger a discovery process to let the viewer explore different insights by themselves. The second type, explanatory, seeks to show a particular insight that the viewer needs to get.

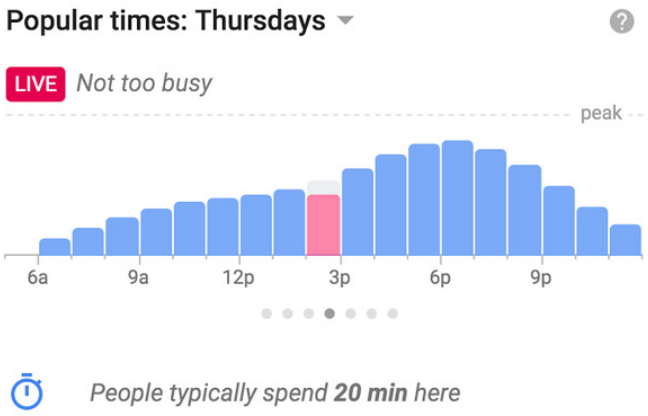


Figure 9

Figure 10

FORMING MEANING IN COMMUNICATION

CONCLUSION

The context is an essential part to form meaning in communication. Without, constructing a correct perception of what is communicated is rather difficult. The key source is to know why something is communicated. By gaining knowledge about why a better-suited judgment or advice can be given. Repeating the question why gives an answer to the background, the context, of the phenomena and avoids the possibility of misunderstandings or implicit assumptions.

Looking at the Golden Circle by Sinek (2009), what makes the context explicit and explained in a structure of three steps (why, how and, what) empathy can be created by allowing others to connect and create a shared understanding. In addition, storytelling is a preferred form of communication because of biochemical and emotional reasons.

The emotional attractiveness relays on empathy and understanding of the story. When the audience connects with the story, they will easier retrieve it. When knowing the audience, the presenter can already look for ways to connect and highlight information what is needed to be shared and why. Hereby, visualisation can be used to support the message of the story.

A long time ago, our ancestors already made use of visualisation, as the visual language is applied to easily communicate to create a shared understanding, regardless of the viewers' knowledge and background. Our preferences for using visualisation is linked to the fact that we react stronger to visuals compared to text. Furthermore, when something looks attractive, we are more willing to use it (Kirk, 2013).

Visualisation services as a trigger to reveal a story and to get a grip on complex data. According to Andy Kirk (2013), there are mainly two types of visualisation functions: exploratory and explanatory. As the second function, which shows particular insights, can be interesting to apply for the active citizens. Data can be visualised in a way that makes it quickly understandable for the active citizen and enables

them to have a meaningful dialogue to gain support for their initiatives. When achieving this, a better understanding of the communicated information and discussion can be stimulated as Scott Berinato (2016) concludes;

"Good visual communication should be used not just to produce better answers but also to generate better conversations."

Use the context to create a clear and understandable communication. Knowing who the audience is can provide a benefit to easier connect and persuade. Making clear why you want to show something and thereby stimulate to make thoughts, which are implicit, become explicit. Let visuals support the communication and thus use an explanatory form to make the message certain to be understood.

From the main insights of the research on the topic forming meaning in communication, One question is taken out (see below) which will be answered in the following part.

How to make data clearly understood by using visualisation? (see p.34)

DECISION-MAKING & INTERPRETATION

Within this part, more knowledge and processes are discussed on how people make their decisions and how they themselves or others can control them. Furthermore, research is done to enlighten how and why people have different interpretations of a phenomenon and the role of shared understanding.

DECISION MAKING PROCESS

Data plays a significant part in our reasoning to make a right decision, but how do we reason? Looking again at the example of O'Neill (2016) about what a mother will make for dinner every night, the models that we are using in our minds are helping us make decisions. We are using two ways to process decision making, via an explicit and implicit mind.

Explicit
When making an explicit decision we are consciously using knowledge of what we already know, that is happing now and in the near future, but also using memories about similar experienced situations in the past (Swaab, 2016). This process is rather slow, consciously and detailed. Awareness of what we are thinking and doing, using our explicit mind, gives us the opportunity to learn new things and think differently and not limited to being able to respond better next time, but also how to deal with it in the future (Swaab, 2016; Gray, & Bjorklund, 2014). Repeated practicing is an explicit activity, when getting experienced the practicing will slowly be steered and taken over by the implicit mind (Gray, & Bjorklund, 2014).

Implicit
The implicit mind can be compared to the human autopilot. Where complex movements are being controlled by the implicit mind, such as walking, swimming, cycling or playing an instrument. These movements were not automatic from the beginning but became automatic after being stored and refined by repeated practicing in the cerebellum (Swaab, 2016). As we are constantly stimulated by an enormous amount of information, our brain is unconsciously focussing on just a selection of the available information (Naude, 2016; Swaab, 2016). The information which has been selected out of the available information turns out to be essential for us. This process makes it possible to provide fast decisions before we even are conscious of such matter. In just less than one second, the brain decides based on what matters to us and uses the context around us at that particular moment to make the best decision. This working process depends on how the brain has been developed over time, what we have learned and what memories we have stored (Swaab, 2016).

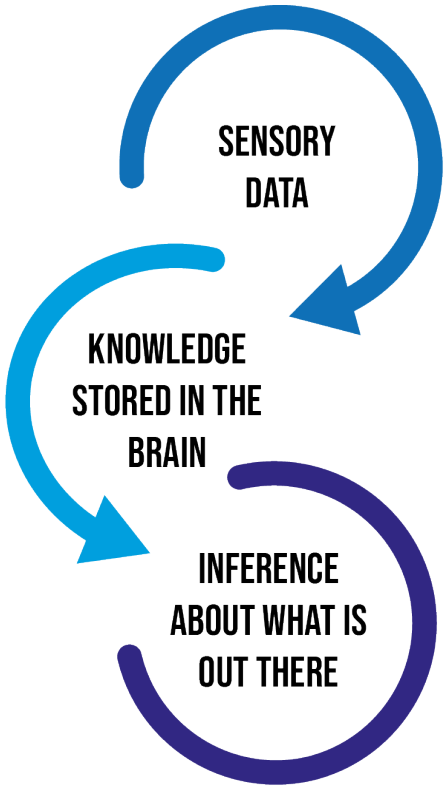


Figure 11

It is possible to have influences on the implicit mind by priming (Gray, & Bjorklund, 2014). For example, you got the question if the word 'Cooking' exists in our world. Anyone will directly answer this question with 'yes.' But if just in a split second a photo of a businessman is shown, it turns outs that people start doubting whether the word 'cooking' does exist (Gray, & Bjorklund, 2014). This example shows that we adjust our decision, unconsciously, really quick according to the context around it. The example shows that when we think about a businessman, we do not quickly or directly link this with the word cooking.

Because priming or simple habits could influence us, it is somewhat dangerous to start thinking about the algorithms which are being made by humans (O'Neill, 2016; Storey, 2016). Since we make unconscious decisions, we should check if what has been decided is correct or not (Storey, 2016). The appearance also has a form of impact to us for example by communicating something in a way that is attractive to us, influences our decision-making process without us consciously realising this (Kirk, 2013) (more about how to make a visually appealing, see appendix A4).

INTERPRETATION, AN UNDERSTANDING PROCESS

Understanding is a psychological process of high importance to give a clear explanation to one another. As Albert Einstein quotes:

"If you cannot explain it simply, you do not understand it well enough."

When understanding something we can assume as Rendgen (2012) states:

"Understanding is power."

Information can be interpreted and perceived in different ways. We use our own knowledge and experience to interpret information to get a good understanding of what is being communicated to us. As mentioned in the chapter about the implicit mind we are just focussing on a selection of information. The process of understanding the information that is being communicated is influenced by individual mental constructs (mindset, perception, feeling, cultural background, beliefs, etc.)(Naude, 2016; Rendgen, 2012; Swaab, 2016).

"Information is validated by understanding. We are what we understand. We remember what we are interested in" (Rendgen, 2012).

Thus, we construct our own perception of reality, as our perception relies on a top-down processing theory (see figure 11)(McLeod, 2008). As the process of understanding is about what is told by someone (sensory data), how you interpret it (knowledge stored in the brain) and what we believe is correct(inference about what is out there), which result in:

"Understanding is a three-edged sword: your side, my side, and the truth."
– J. Micheal Straczynski.

UNDERSTANDING DATA

A method which represents the procedure and relationship between data, information, knowledge, and wisdom is the DIKW pyramid of Wurman (see figure 12) (Naude, 2016; Rendgen, 2012) which explains the way we are moving to these layers.

Research shows different types of models that have been created based on the pyramid of Wurman (Naude, 2016). The follow-up model, Continuum of Understanding by Clark, time-space was added since the understanding process: data, information, and knowledge are experienced in the past, while wisdom is more focussed on the future (Naude, 2016)(see figure 13).

Naude (2016) concludes that since each part is influenced by the other by a feedback loop, the model would be better presented as a cyclical process (see figure 14). Within this cyclical process, an understanding process is included in every aspect of the cycle as figure 14 shows.

Data represents a research of collecting raw symbols as singular facts or numbers that by itself does not tell anything since no correlation, pattern or causation is shown. Information is the phase which provides data parts with context and structure (answering who, what, where, when and, how) resulting in the data becoming being meaningful and giving it purpose. Knowledge is about how all the information gathered can be transformed into something meaningful and implemented, and provide the knowledge of how and why. The last phase, wisdom, is to know and understand the whole process and have an evaluated understanding, acceptance and appreciation; it is what it is and thereby being able to give a common-sense judgment about it. An example of this is: we are understanding the weather if we are able to predict it. (dark clouds indicate the change that it soon will start raining).

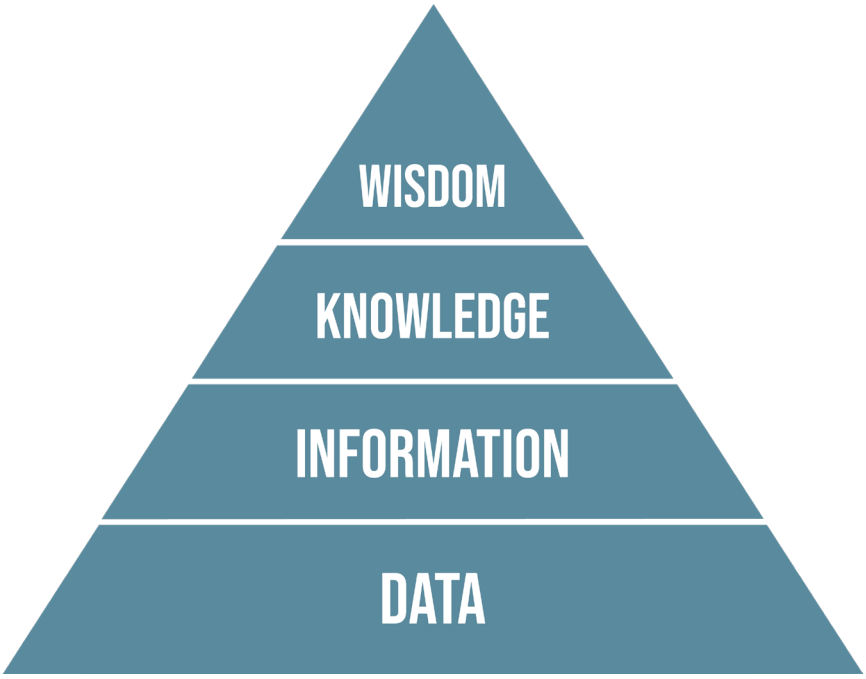


Figure 12

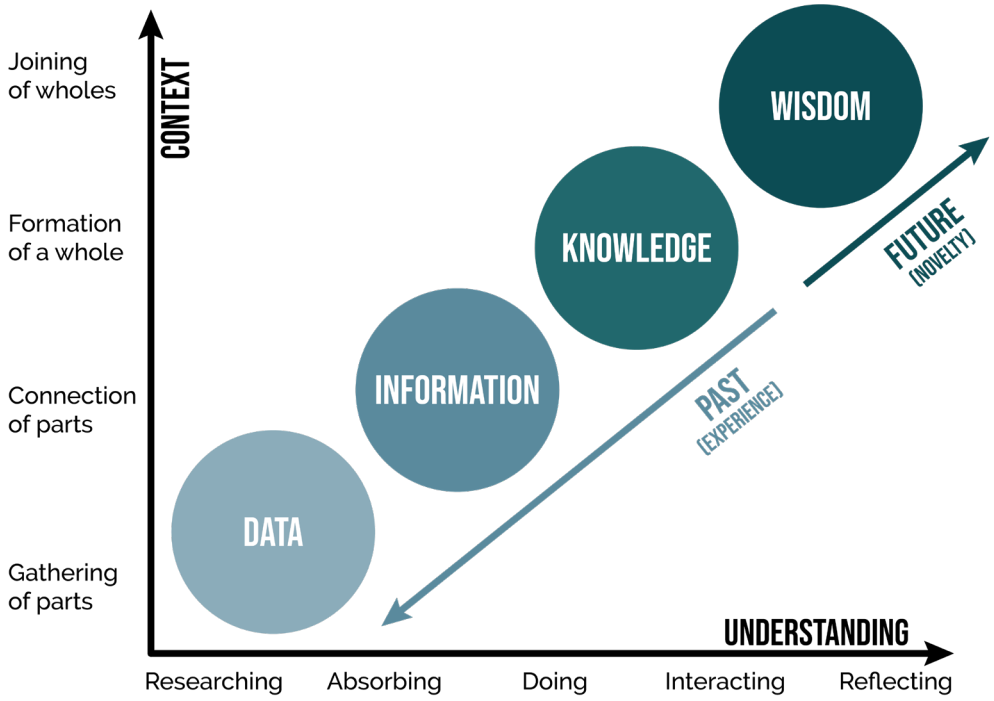


Figure 13

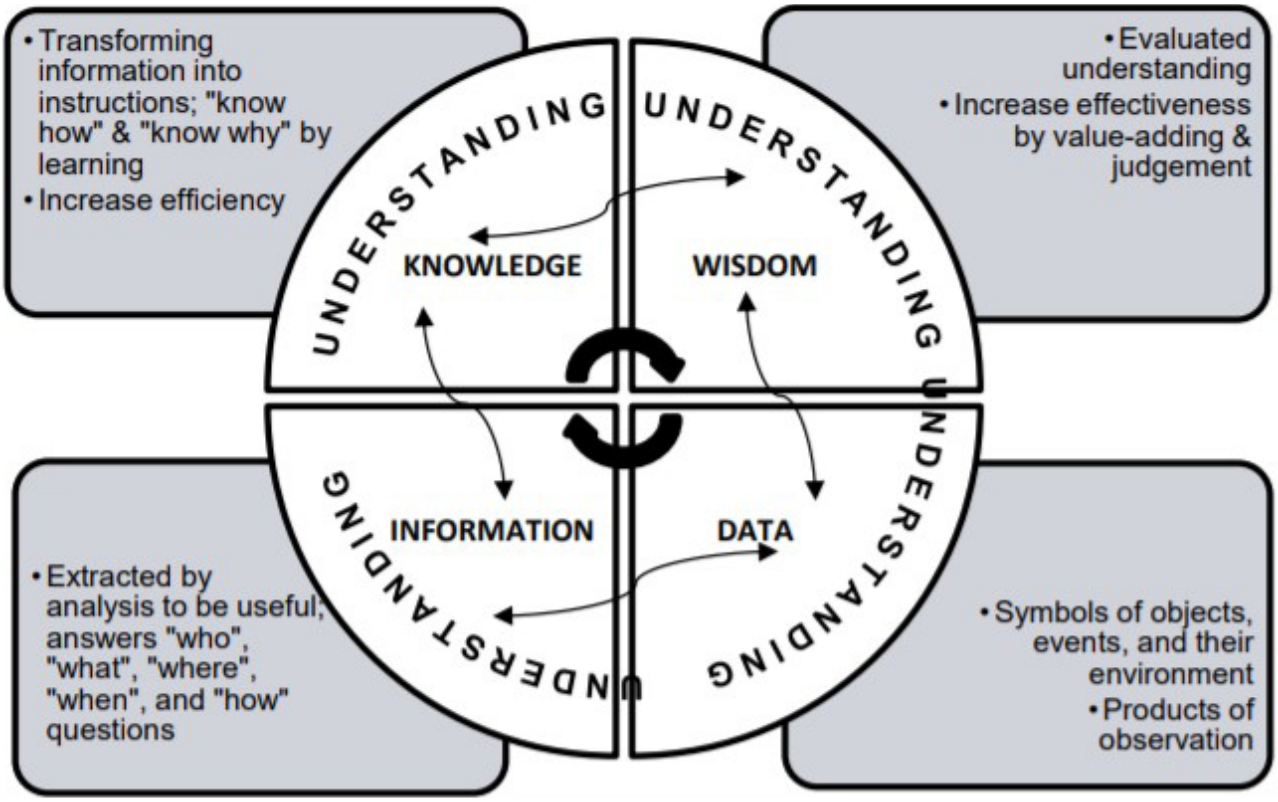


Figure 14

Even complex data can be translated into simplified visualises that anyone can understand (Rendgen, 2012). A good example is the world of 100 created by Toby Ng. His design visuals are focussed on all kind of different topics with a subtitle 'if the world was a village of 100' (see for example figure 15A, 15B and 15C).

According to Kirk (2013) to facilitate understanding, when looking at a visual, the viewer will go through an understanding process consisting of three stages: perceiving, interpreting and comprehending (see figure 16). Every stage is depending on the previous stage whereby the first stage is concerning how well the chart is readable. The second stage is about transforming the shown insights from the first stage to the real meaning of it. The last stage relates to the way the viewer is attracted to it and creates a reasoning when it is triggering their reflection of what it means for them.

What the viewer will get as information from the data depends on their interest, knowledge, and preference for the topic. Having an affinity with the topic has significant influences on how the data is understood (Kirk, 2015). Thereby it is important to understand the targeted audience and what it is you want to show them (Berinato S., 2016). Furthermore, the needs and aim of the audience should be known in order to persuade them (Brath, & Peters, 2004). This information must be obtained before creating visuals representing data. As data can be interpreted in many ways, it is important not to show too much information. Only relevant information should be shown to communicate a clear and understandable story towards the viewers (Berinato, 2016; Brath, & Peters, 2004).

"Graphics and Visualisations serve to communicate information" (Rendgen, 2012).

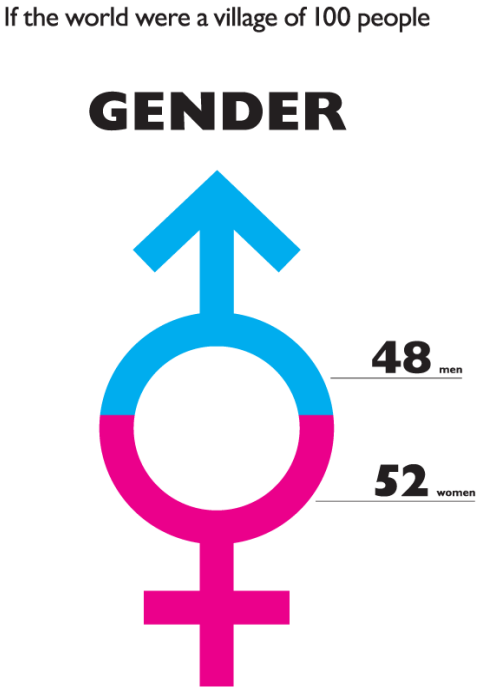


Figure 15a

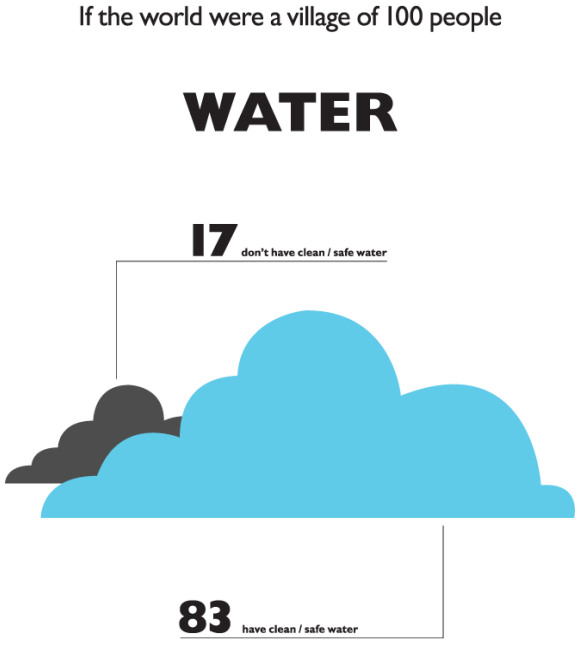


Figure 15b

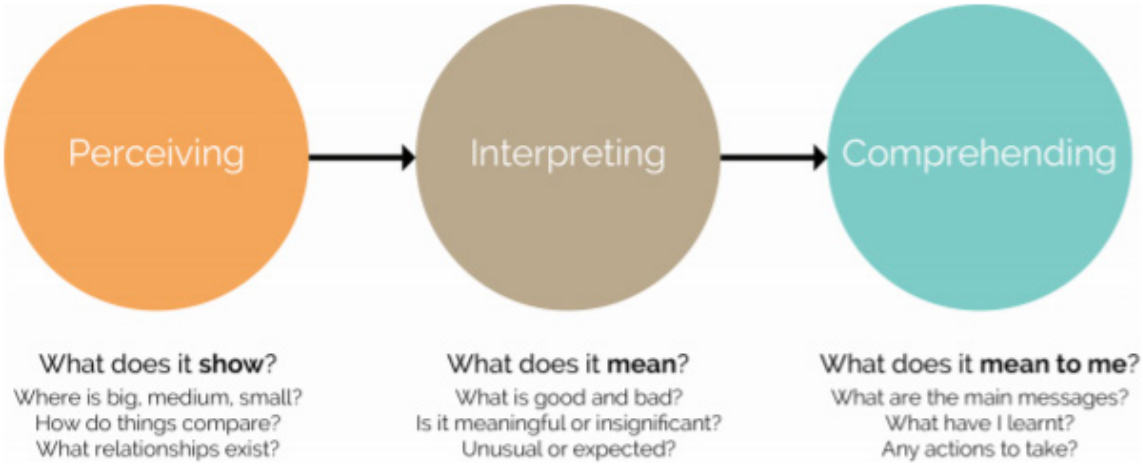


Figure 16

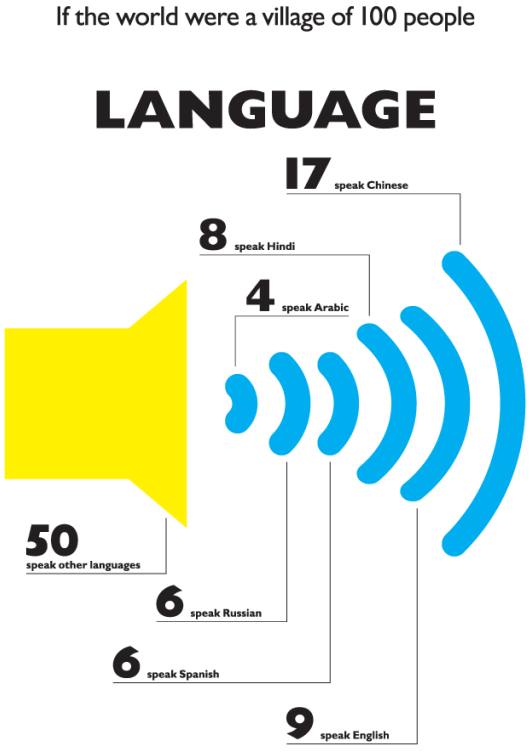


Figure 15c

DECISION-MAKING & INTERPRETATION

CONCLUSION

Decision-making is conducted through the use of two different approaches, explicit and implicit. The explicit-mind process is slow, consciously and detailed in contradiction to the implicit mind, which is performing automatic, fast and unconscious.

Priming or habits can influence the implicit mind as people can adjust their decision, unconscious, very quickly according to the context around it. Because of this, an extra check of what has been decided is essential. Especially when making important decisions and drawing conclusions from data. Therefore, staying critical is important what can be stimulated by to evaluating the phenomena. By evaluating, a more consciously approach to the mind will be encouraged what will result in a better critical approach.

The process of understanding information that is being communicated is influenced by individual mental constructs (mindset, perception, feeling, cultural background, beliefs, etc.). This has influences on the selecting process of information which is taken in by the brain unconsciously, as the information selected is valuable for us. In this way, we conduct our own perception of reality, which differs for everyone and might not even be correct. It is important to take into account that this form of reality might mimic with the reality of someone else, what makes a shared understanding hard to accomplish.

When more information (context and structure) is given, the better someone can understand and be able to translate the information into knowledge. The model of DIKW adjust by Naude (2016) visualises the process of understanding in an interesting and valuable way. The cycle, including the feedback loop, is interesting to apply for conducting data by the users. The cycle helps to avoid biased or fails interpretations because of the evaluation. A feedback loop can, therefore, be integrated to stay critical and to be able to give a common-sense judgment or advice. Furthermore, the model provides

answers to how, who, where, when, what and why (1H5W) which are essential to gain a good grasp of the information.

Visualisation can support the process of facilitating a shared understanding. Still, the information the viewer will consume is depending on their mental constructs. Triggering the interest of what can be taken out as value for both the viewer and presenter.

As data can be interpreted in different ways, staying critical is of high importance to stimulate to get a right perception of the phenomena. Therefore stimulate to use the explicit mind and to evaluate on what is has been shown, will create a critical view towards the data. Furthermore discussing together with someone else, helps to break the influences by habits even more and brings in new perspectives. Data must be clear and present with answers on How, Where, Who, What, When, Why (1H and 4W) to understand the data rightfully and to make a common-sense judgment or advice after evaluating.

SMART CITY & COLLABORATION

Urban development is shifting, which brings new opportunities and collaborations, a chance to be enhanced. Research is conducted on smart city developments and collaborations within this motion to get a grip on this matter. At first, the stakeholders who are part of the collaboration within Rotterdam will be discussed, and the term smarty city explored in general, and what it means for Rotterdam. In the end, the different collaborations within this development are researched followed up with some examples.

STAKEHOLDERS

The stakeholders involved in the process of submitting an initiative are the active citizens, local commissions, neighbourhood caretakers, area networkers and the overall municipality of Rotterdam. In this chapter, the stakeholders will be described and explained regarding their role among initiatives for the city and why they are interesting within this network of stakeholders.

MUNICIPALITY OF ROTTERDAM

Rotterdam is one of the most innovative cities in the Netherlands. The municipality made a move that stimulates the feeling of trust and transparency by sharing databases for anyone to be used (PBLQ., 2015; Morey, Forbath, & Schoop, 2015). The city did not stand still and embraced the idea of becoming a smart city (iBestuur, 2016; PBLQ., 2015).

Smart City

The need to become a smart city arises from the urge to manage the city better and to cater to the needs of the citizens today and in the future. The drivers to become a smart city are the growth of the urban population, economic growth, technological progress, and environmental sustainability manage (Naphade, 2011). The Smart city is a new strategy to enhance the performance and sustainable circumstances of the town (Letaifa, 2015). Creating a balance between social and economic growth in the context of urbanization is the primary driver to apply this strategy (Naphade, 2011). The definition of a smart city is according to Letaifa (2015):

"Smart cities are hybrid models combining democratized open innovation with central city support, coordination, and monitoring."

Within the model of a smart city, no real bottom-up nor top-down approach is applied (Letaifa, 2015).

The development of a smart city results in an exponential increase in usage of data (Hashem, 2016). The big data will provide rich insights generated from different data sources. As Rendgen (2012) states:

"Governments that dare to face the sea of open data explore how they can go beyond understanding and encourage their citizens to become involved."

To realise the outcome of rich insights, the collaboration will be encouraged to create a network to provide the most effective performance (Hashem, 2016; PBLQ., 2015). As a result of collecting more specific data of citizens, the danger of developing a smart city within the topic of privacy is of high importance and must be taken into account (Liukku, 2017, May 29). It turns out that the citizens are willing to share data but expect to receive some value in return (Morey, Forbath, & Schoop, 2015).

A variety of stakeholders are engaged in decision-making. Public services and new technologies are used to strengthen the collaboration between citizens and urban governments (PBLQ., 2015; Viale Pereira, 2017). A shared network must be secure and strong to collaborate and reveal this platform of knowledge, opportunities, and innovation (PBLQ., 2015). By getting closer to the citizens, a citizen-centred focus can be realised, and shared goals can be achieved. This new strategy is mainly ICT based, ICT will be an essential aspect involved becoming and developing the smart city (Letaifa, 2015; PBLQ., 2015). ICT facilitates support within the network of relationships between government, citizens and other stakeholders (Viale Pereira, 2017; Pereira, 2017).

Smart city Rotterdam

In the vision of Rotterdam comprehending the concept of a smart city means, the primary focus is on the long-term development of innovations (Gemeente Rotterdam., 2017d; Future City Foundation., 2017, November 14). To strengthen this vision, innovations must have the purpose of providing better management of efficiency and sustainability of the city (Gemeente Rotterdam., 2017d). An example of one of these innovations is a more efficient way of collecting the domestic waste (more about related projects can be found in an interview in appendix A5). By using a fillings degree meter implemented as a sensor within the domestic waste containers in the neighbourhoods. These sensors are connected to a route planner that calculates the most efficient route to collect the household waste. By applying this system, the result is a decrease in CO2-emissions and a more efficient way to manage the household waste (Gemeente Rotterdam., 2017d).

Opportunities aligned with the development of a smart city where the municipality wants to focus on are: Smart Port, Smart Industry (innovation-hub), Smart Care, Smart Mobility, Smart Planning (main focus on the infrastructure with Rotterdam), and Smart Events (bring together different kind of organisations and citizens to collaborate) (PBLQ., 2015).

Smart city Rotterdam is applying the CANDO-mentality (KENDOE-mentaliteit) (Gemeente Rotterdam., 2014b). The aim of this mentality Rotterdam has created is to give more stimuli to experiment and innovate, 'kan niet bestaat niet' (cannot do, does not exist) (PBLQ., 2015; Gemeente Rotterdam., 2014b). The aim is to realise this mentality by starting collaborations between all Rotterdam citizens and organisations. This collaboration network is the most critical factor to achieve to create the smart city Rotterdam. By doing so, Rotterdam created new platforms and made databases open for the public to use; an example is the Rotterdam open data platform. But it turns out that anyone barely uses the open databases. Even, when the data is downloaded, most is used for fun instead of applying it for the actual purpose (more about the usages of open data in Rotterdam can be found in appendix A5). It turns out that the data is not tangible or enough, is not attractive or too much time to consume and to explore. Thus currently, there is a lack of understanding and attractiveness of the open data what result in a pore interaction and usages of the open data.

The Rotterdam municipality fulfils different roles within this network of collaboration. They act as facilitator in the innovation process of the Smart City Project, connecter between a diversity of stakeholders and stimulate to connect, launching customer (embrace the initiatives, make the initiative be heard to realise the finances), ambassador and initiator of social innovations to manage that innovations generate social contribution next to economic belongings like profit (PBLQ., 2015). The smart city development has gained a positive effect in being an answer to the need and creation of a new form of democracy where the citizens are willing to be heard and get a better chance to share their knowledge and initiatives (PBLQ., 2015).

In perspective towards the role that the citizens can provide within the smart city, the municipality of Rotterdam envisioned three different roles; end-user, co-producer and registered (PBLQ., 2015). End-user: applying a smart application to provide the best use of energy, mobility, health, etc. Co-producer: citizens can show initiative by sharing data, participate in projects or give their initiative to share. Registered: let organisations gather data of the individual citizens. The focus will be on the co-producer citizens who are interested in sharing their own initiative (PBLQ., 2015).

AREA COUNCIL, NEIGHBOURHOOD COUNCIL AND NEIGHBOURHOOD COMMISSION

Rotterdam is a famous port city with 639.864 inhabitants located on the west coast of The Netherlands(Gemeente Rotterdam., 2018, April). Rotterdam has fourteen areas and seventy neighbourhoods (Gemeente Rotterdam., 2018a). An area consists of a few neighbourhoods, for example, Delfshaven (area), includes nine neighbourhoods, for instance, Middelland (neighbourhood) (see figure 17).
Twelve areas are counselled by twelve local (area) councils (Gemeente Rotterdam., 2018a). Within two areas, Feijenoord and Noord, fourteen neighbourhood councils replace the local council (Gemeente Rotterdam., 2018a). The municipality of Rotterdam is conducting an experiment in three areas (Charlois, Delfshaven, and Prins Alexander) where, next to the local councils, in each area, two neighbourhood commissions are designated (Gemeente Rotterdam., 2018a) (see figure 18 of an overview of different areas and commissions).

The local councils have the authority to share their thoughts and ideas to develop their area. A local council consists out of nine and up to fifteen members, depending on the size of the area. To become a member, they must go through an election (Gemeente Rotterdam., 2018a). The local council member knows his/her area best and thereby recognizes the needs and problems within his/her area. In addition, the local council can advise the city council if needed. The local councils were supposed to play the role of 'eyes and ears´ of a particular area in Rotterdam, but the way of working and performance of the local councils turns out to differ a lot per area (Bronsveld, C., & Gemeente Rotterdam., 2016). This results in a diversity of how the areas are counselled. Furthermore, the task of the local council is to create an area council agenda which contains ideas to improve the area and monitor if the plans are being realised and in which way. This agenda is established together with the adjacent area, other organisations, and other authorities if necessary (Gemeente Rotterdam., 2017, December 27).

The neighbourhood council and neighbourhood commission consist both of five members and have the same function as the area council but then for the neighbourhood (Gemeente Rotterdam., 2018a).

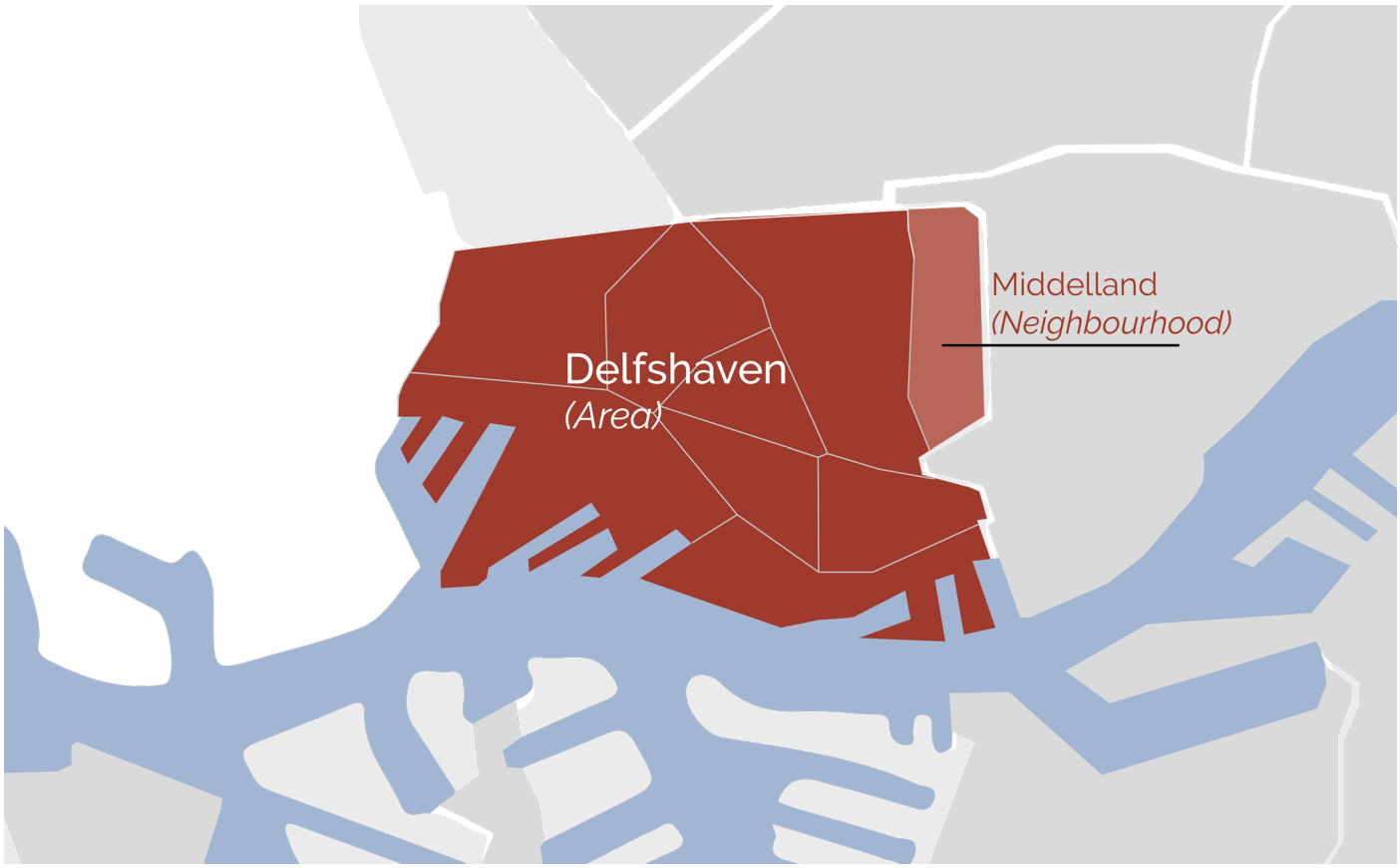


Figure 17

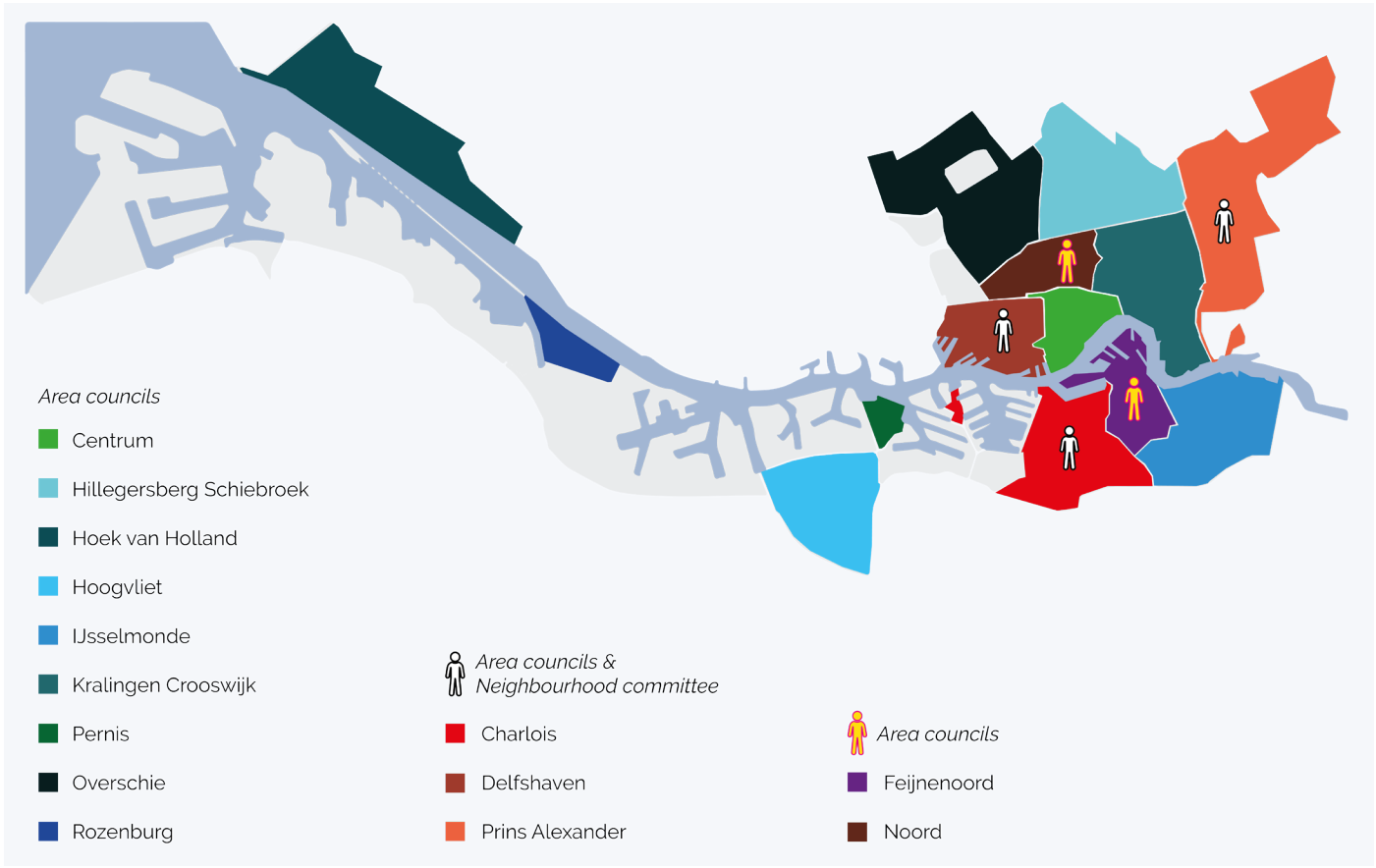


Figure 18

MUNICIPALITY SUPPORT WITHIN THE NEIGHBOURHOODS

On top of the local commissions (local council, neighbourhood council and, neighbourhood commission), a 'neighbourhood caretaker' and an 'area networker' are working for the municipality to give support for the local commissions, the initiators, and the neighbours.

Both employees are working in the neighbourhood to be closer and easier to reach for the citizens to give support. A neighbourhood caretaker maintains if the neighbourhood is safe and clean (Gemeente Rotterdam, 2018b). Furthermore, this person is a contact person for daily issues with the neighbourhood and gives support to keep enhancing the neighbourhood.

An interview was held with the area networker of Middelland (neighbourhood of Delfshaven (area)) to get a better perspective of their role (see appendix A6). The area networkers are the direct ears and eyes for the municipality of the specific neighbourhood they are working with, as they need to create a connection between the initiator and the municipality. They are constantly observing the neighbourhood to get to know what is happening and what problems might occur. The area networkers give support to the initiators in the neighbourhood. When contact is needed from the municipality, the area networker helps the initiator to get in touch with the right person.

ACTIVE CITIZENS

Defining the active citizens is quite tricky since the active citizen could be any of Rotterdam who is willing to share their ideas and thoughts to build on their city's future. An active citizen is a Rotterdam citizen who is willing to act and know what he or she wants to accomplish but is still in need to get some extra support in making a solid case to persuade the municipality. This group of active Rotterdam citizens will not be further defined since age, gender or background are considered irrelevant.

Needs and problems
There is an increase in citizen initiatives, and these initiatives are seen as a new form of participative democracy (Bronsveld, & Gemeente Rotterdam., 2016). The active citizens want to have a voice and decide together with the municipality about the development of their city (Bronsveld, & Gemeente Rotterdam., 2016). The municipality has responded to this trend by changing their vision and started to develop a smart city. Still, the active citizens' struggle with getting in contact with the municipality and support of the local commissions is considered to be really divergent (Bronsveld, & Gemeente Rotterdam., 2016). The citizens want to be supported more by the municipality in making their initiative work out well, as research in 2014 showed this need is shared by 87% of the initiators (Bronsveld, & Gemeente Rotterdam., 2016).

OVERVIEW OF THE STAKEHOLDERS NETWORK

After analysing the stakeholders, a good overview of their current network is made. The overview clearly shows what was already mentioned in the research of citizen initiative, the absence of a good connection directly with the municipality as for the active citizens, the neighbourhood caretaker or area networker could be contacted. Thereby the focus of this project will be on enhancing specifically this connection and leaves the local commissions and neighbourhood caretaker out of the scope (see figure 19 for the overview).

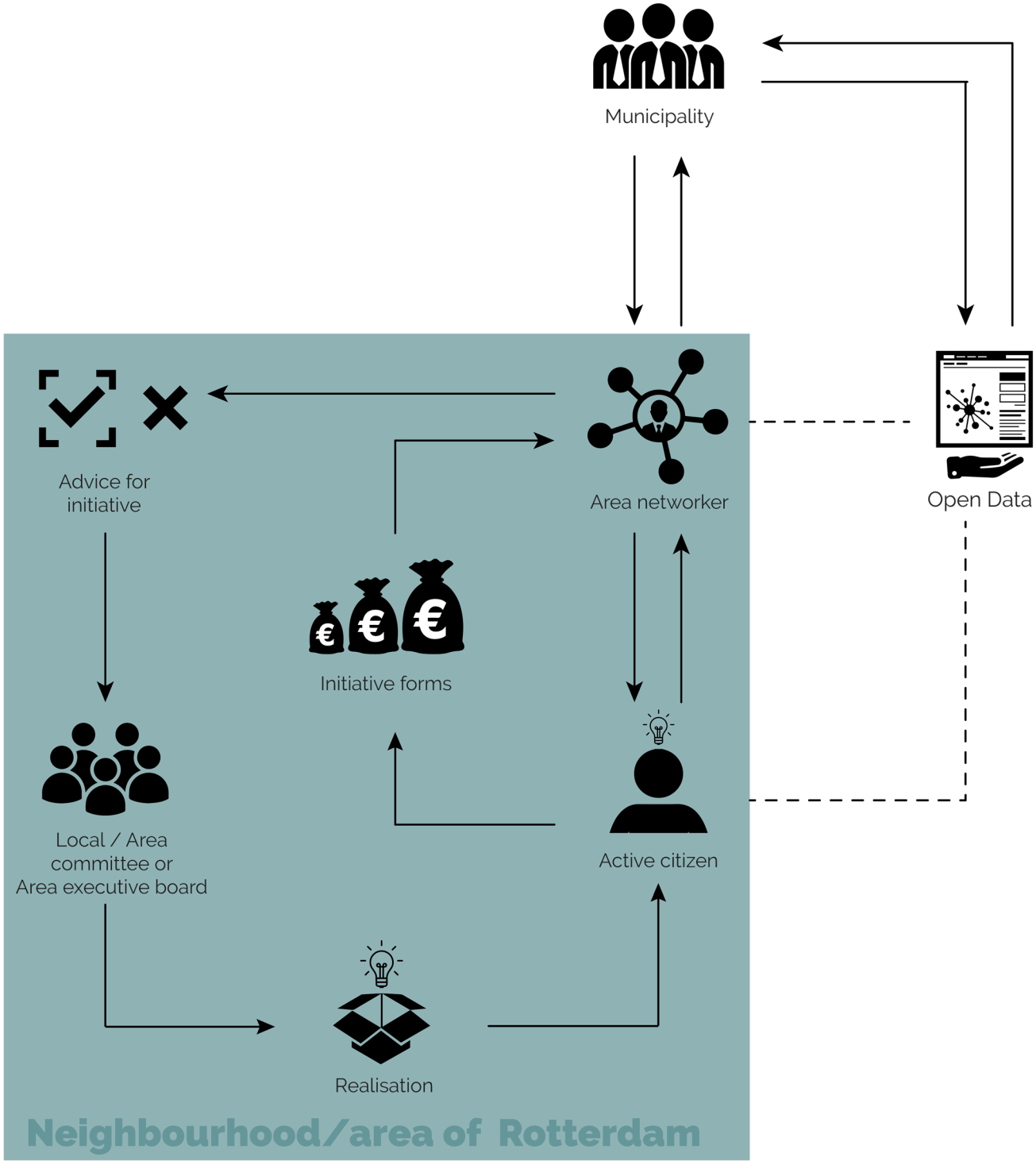

Municipality
Open Data
Advice for initiative
Area networker
Initiative forms
Local / Area committee or Area executive board
Active citizen
Realisation
Neighbourhood/area of Rotterdam

Figure 19

COLLABORATION BETWEEN MUNICIPALITY AND CITIZENS

Rotterdam is developing a smart city, which results in rising opportunities for citizens to become more involved to establish a strong and effective collaboration between the citizens and the municipality of Rotterdam. At first, a clear overview will be provided in what is understood with the terms 'top-down and bottom-up collaboration approach'. In addition will be focussed getting an overview of essential platforms that currently play a role in handing in initiatives made by citizens. An interview has been conducted with an area networker and an employee of the municipality of Rotterdam who with more expertise on the development of Smart city Rotterdam to gain an understanding of the current level of involvement of citizens and future expectations,(for both interviews see appendix A5 and A6).

BOTTOM-UP & TOP-DOWN MODEL WITHIN A SMART CITY PERSPECTIVE

The Smart City concept, which the municipality of Rotterdam is developing, does not directly have a bottom-up or top-down approach. What is a bottom-up and top town approach with the perspective of a smart city?

As mentioned, there are two models: bottom-up and top-down. Whereby a bottom-up approach is as Walravens (2015) states:

"Change and improvement comes only from the people using the city…those who live, work, and engage in all kind of activities in the city."

In this model, citizens but also small businesses or start-ups within the city are in control of what will be developed in the future. A good example is the application of Uber, a private driver service (Walravens, 2015). A top-down approach has an opposite model of the bottom-up approach, an example in the perspective of the smart city is the municipality being in control by creating an algorithm to optimise the city.

As the development of a smart city embraces the bottom-up approach, control by the citizens, start-ups or small business is not enough (Mulder, 2015). To succeed a control of the top-down approach is needed to provide the right tools and network to make the output durable and no problems may occur as the development of the Uber became a treat of the current taxi industry (Walravens, 2015). Thus, to make a smart city work out well, both models need to be applied (Mulder, 2015). For instance, with the top-down model example by creating an algorithm, feedback and context are necessary to provide the right outcome. In which collaborating is key, especially with a goal to develop a citizen-centred approach as Rotterdam is aiming for.

COLLABORATION BETWEEN THE MUNICIPALITY OF ROTTERDAM AND THEIR CITIZENS

Currently, there are many different ways to connect with the municipality for citizens to share their initiatives. This project is focussed solely on the collaboration forms, which relate to the submission of initiatives. The most relevant active platforms within this focus at the moment are burgerinitiatief loket, bewonersinitiatief, Opzoomer Me, Citylab010, Right to challenge and the MAEXChange (Bronsveld, & Gemeente Rotterdam., 2016)(more about this platforms, see appendix A7).

NEXT TO THESE PLATFORMS

Co-creation has been out there since 2000 (Crandell, 2016, 10 June) but is slowing taking into process within the smart city concept to achieve a better and stronger network of different stakeholders and thereby results in a better citizen-centred approach (more over co-creation, see appendix A8). Within the areas of Rotterdam, the way of collaboration differs a lot, which is a clear issue since working together with other local commissions or area networkers is quite hard. In order to change this, Rotterdam has started a pilot in the neighbourhood 'Middelland' called 'Mooi, Mooier Middelland' (Beautiful, more Beautiful Middelland) focussed on a collaboration by applying co-creation as a method. To get a better insight of this pilot an interview was held with the area networker of Middelland (for more information about this project, see appendix A6).

Setting-up this way of working turned out to be not that easy. As events were organised to share ideas and thought together with the area networker, local community and the neighbours turned out to be not that fruitful, since almost no neighbour showed up. The local community along with their area networker of Middelland had to find new ways to involve and connect with the neighbours. As an example, they wanted to make a new plan to refurbish a playground. To attract more neighbours, a BBQ was organised to join some music, food, drinks and share thoughts about refurbishing the playground. The area networker was sitting with paper, a map of the playground and pencils to talk with the neighbours and let them start creating their ideal situation of the playground. The BBQ turned out to be a great success as kids who were curious gave their ideas, which slowly made the parents and other neighbours join the conversation as well and started to share their opinions. As applying this method showed off success still, a long-term relationship is not yet achieved and to organize this kind of events for every step of the development is not realistic. This complication still needs improvement within the process of applying a co-creation approach. As the pilot has proved to be more effective, it is expected is that this way of working will be used in other areas within Rotterdam.

COLLABORATION IN OTHER COUNTRIES

Collaboration in perspective of a smart city is defined as 'civic technology', a process whereby different stakeholders (citizens, organisations, and government) want to work together to improve the infrastructure of the city and government services (Wood, C., 2016). The reason why the municipality wants to spur a dialogue between themselves, organisations and the citizens is primarily to achieve truly citizen-centric services and operations (Viale Pereira, 2017). It turns out that creating a good collaboration with different stakeholders is quite hard to achieve. To get a good insight in methods used by other countries to gather inspiration and knowledge a few case studies will be analysed. Different layers of sharing initiatives are out there. As different formats are used such as applications, open databases, games, websites or social media to strengthen the collaboration between the municipality and citizens.

Most of the initiatives are emphasising on specific parts like creating awareness about a problem for example with 'Wide Noise' an application to collect samples from the evidence of noise of the surrounding environment (see figure 20) (Ertiö, & Bhagwatwar, 2017). Another example of a successful application is 'Waze', which provides a two-way exchange of a navigation service (see figure 21) (Pereira, 2017; Feder-Levy, 2016, September). As agents of the city hall can be informed about the situations on the roads, citizens can use it to get an overview of the traffic conditions and report traffic situations themselves (Pereira, 2017; Feder-Levy, 2016, September). Citizens and agents beneficially use the data of Waze. It is also applied to locate ambulances and identify occurred accidents (Viale Pereira, 2017). Waze makes change possible within the behaviour and finally the patterns of the traffic situations around the city (Feder-Levy, E., 2016, September). A similar tool is 'FixMyStreet', which allows citizens to report issues among the city infrastructure and public spaces (see figure 22) (Walravens, 2015). The service is available as an application and website. The reported issues are being sent to the right local governments and this allows issues to be solved quicker. There are also more neighbourhood orientated applications (also available as a website) like 'Neighborland'(see figure 23). This platform gives the citizens the opportunity to develop their neighbourhood by sharing their wishes, issues, resources, propose ideas and organize themselves to take action within their neighbourhood. The team behind the platform gives support to do something with the ideas and let the citizens act (Ertiö, & Bhagwatwar, 2017).

Another format is gaming, for example 'Block by Block', in a Visualisation based on the game Minecraft, as a conversation starter to let citizens re-design public spaces (see figure 24) (Ertiö, & Bhagwatwar, 2017). By using a game form that is familiar to the user, the thresholds are reduced. For multiple case studies, it turns out that social media is of great support to increase the number of participants. Social media provides word of mouth, collect feedback and thereby provides support for decision-making on a citizen-centred bases perspective (Viale Pereira, 2017). Social media like Twitter, Facebook, and blogs, turns out to be enabling contact with citizens and the municipality and is of great support to gain insights and to share ideas (Ertiö, & Bhagwatwar, 2017; Sandoval-Almazan, & Gil-Garcia, 2012).

Research shows clearly that the approach is mainly focussed on online channels like social media (where Facebook and Twitter are the most popular), crowdfunding or other platforms of the municipality. Furthermore, tools are used to create awareness about a problem (Widenoise), the data collector (Widenoise, Waze, FixMyStreet), a conversation starter (Block by Block) or discussion platform (Neighborland).

Figure 20

Figure 21

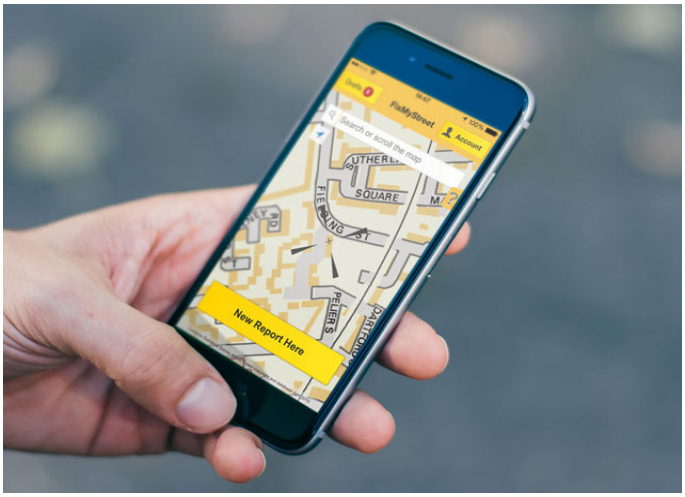


Figure 22

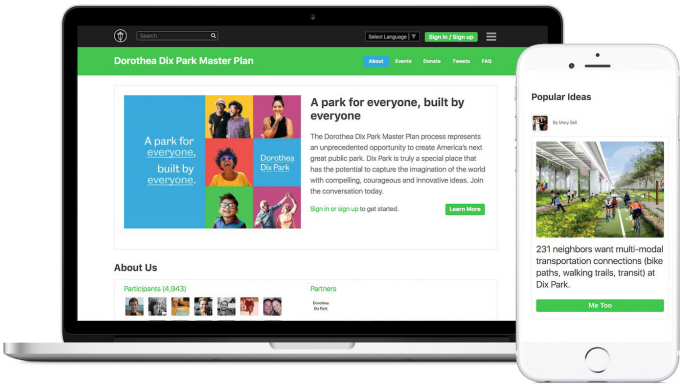


Figure 23

Figure 24

SMART CITY & COLLABORATION

CONCLUSION

The development of Smart City Rotterdam is in high progress. This development aims to enhance the performance and needs of the city and her citizens. It allows new opportunities for a network and interaction between the municipality and the citizens. To gain a strong collaboration trust and transparency is needs to be expressed.

The usage of data is playing a huge role within this process since data is used to gain insights of the phenomena and explore patterns to start to optimize and innovate the city. New technologies allows to make data a powerful asset. In addition, a rise in collecting data of the citizens is growing to collect information about their needs, behaviour patterns and, possible problems or issues.

To obtain the citizens' trust to use their data, the municipality has made databases open for public use. The citizens can use the open databases to oversee the data and apply it to possible initiatives as support. The goal is to co-create along with the citizens to explore new opportunities and innovations. Currently, the collaboration or way to share initiatives is conducted via multiple platforms, which are mainly focused online, since this form turns out to be of great support due to the use of social media. Furthermore, a pilot to co-create is ongoing within the neigbourhood Middelland (in Delfshaven). Area networkers, local commissions and, active citizens are working together.

Still, the collaboration progress via the open data turns out to be not that attractive. Since the citizens see data as difficult and complex. Furthermore, the area networker, who provide support for the citizens' initiatives, shares this perspective and are not really making use of the open databases.

The tools, which are developed, are mainly all collecting data by a diversity of people (both citizens, organisations and, municipality). A focus to collect data in an easy matter can help to stimulate to start applying the data

by analysing it or take out all main insights. This form of collecting data will be taking out as inspiration for the next chapter 'Analyse'. Clearly, all tools developed to support the creation of a smart city are all digital tools. Therefore, the preferred digital form will be taken into account for the design brief in the chapter 'Analyse'. Although the citizens are the main target group for the open databases, the area networkers must become involved as they service, stimulate and manage a network between the municipality and the citizens.

Involve municipality employees

Focus on digital tool

Collecting data together

OVERALL CONCLUSION

DISCOVER

The project kick-started with the following practical research question:

HOW CAN ACTIVE CITIZENS BE SUPPORTED BY DATA TO BEGIN COLLABORATING AND SHARE THEIR INITIATIVES? (WITH THE MUNICIPALITY)

Within the chapter Discover, all insights are collected and engaged to answer the five sub-research questions. Thereby the main research question will be answered by the sub-research questions.

What is the word 'data' referring to within this project?
Data is associated with a large variety of meanings. Therefore, it is of utmost importance to set a clear definition of what 'data' is referring to in this project. The word 'data' within this project can refer to big data; 'what is happening' or thick data; 'why.' The focus on what is happening and why results in a complete picture of the phenomenon and makes it possible to see new, better and different insights and understand why something is happening. Keeping in mind that this data is a dynamic model, having a critical view is of high importance. Allowing a feedback loop within the process of understanding the data creates an essential perspective to achieve.

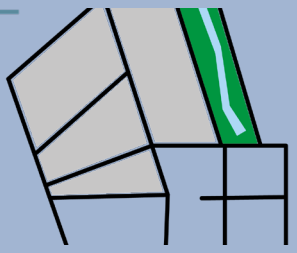
How can data give support for the active citizens?
Craving for a prophecy, which allows for more convenience while having more certainty towards the outcome is a natural need. Data provides support to see new, better and different insights to give the evidence to support the idea of the active citizen. By using data and applying the active citizens' knowledge, thick data, a complete understanding of the phenomenon becomes more feasible.

How to create a shared understanding?
Context turns out to be the key to create an understanding of a story. To provide enough context, implicit thoughts must be stimulated to become explicit. This can be done by repeatedly asking why.

When the context is clear and understood, a shared reality of the phenomenon is established.
Since the creating of perception is influenced by the individual mental constructs, knowing the audience can help to highlight the right aspects that relate to their interest to make a shared understanding easier to achieve. Furthermore, visual language can be added since visuals are quicker and easier to understand compared to text. Thus, context, the reasoning of the why (thick data) and applying visual language boost achieving a meaningful dialogue resulting in a shared understanding.

How to share an initiative with the municipality?
The answer to this question remains since a real 'how' is not yet found. However, it is clear some best practices on how to share an initiative have been revealed. Next to creating a shared understanding, a common goal or challenge to be achieved can also spur a better collaboration. Furthermore, applying the method of the golden circle by making the right implicit thoughts explicit to convince and create empathy for the listener. Another technique is an explanatory way of presenting the initiative. Besides, the DIKW model adjusted by Naude (2016) can be used to let the municipality give a common sense judgment.

Why does the municipality want to collaborate with citizens, and how?
Building a smart city demands a good and clear collaboration between the municipality and citizens, creating trust and transparency are fundamental principles. The municipality of Rotterdam wants to practice a citizen-centred approach resulting in a durable relationship with durable initiatives being developed. To achieve this, access to open databases is available for the citizens. Furthermore, a diversity of online platforms can be used to share and submit initiatives. In addition, area networkers are working hard to stimulate and strengthen the network between the municipality and citizens. One of their responsibilities that contributes to this principle is supporting the active citizens with their initiatives.



Analyse
& engagement
of insights found

ANALYSE

INTRODUCTION

Within the chapter 'Analyse' knowledge from the previous chapter is related to each other and merged into a problem definition and focus. After creating a focus, the target audience is further analysed, resulting in a persona and short description. To ground the reason why the problem must be solved, a raison d'être is formulated. Before formulating the design brief and value proposition statement, a future trends analysis, related to the context, has been made to get a clear perspective of future developments. This analysis provides insights of the surplus values of these trends whereby the main appreciated values are merged in the value position statement.

ANALYSE

PROBLEM DEFINITION

As smart cities are arising, data has become open for public use to provide insights and spur for new ideas in urban development. The open databases are created to strengthen the network between the municipality and their citizens. Shared understanding leads to new ideas that solve existing and new societal problems. However, for all those who are not data literate nor see the meaningful use of data – big data presents itself as a mystery and any decision-making support is lost.

The main problem found in the Discover chapter, is that creating a connection with the citizens via the open database is not easy, nor appealing and neither used by the citizens or the area networkers, who give the citizens support for their initiatives (see figure 25).

FOCUS

To achieve the goal to stimulate the citizens to start using open data efficiently the problem is divided into three steps (see I, II and, III).

I First, the persons who provide the connection and support for the active citizens, the area networker, should become familiar with the use of data and learn to apply it in a valuable way. When the area networkers are familiar and willing to apply data within their daily responsibilities, the next step can be made.

II In the second step, at first, a possibility for the area networkers to share insights amongst each other must be created to strengthen their networker. Besides, the area networkers can start showing meaningful use of the data for the active citizens by providing supporting data insights for the initiative. In this way, the area networker stimulate the active citizens to start applying data for their initiatives and become more familiar with it.

III In the third step, open data can be perceived as extra support not limited to the area networker, but also for the active citizens and maybe even to other citizens who initially did not show interest in sharing their initiatives or vision.

To make the design goal tangible within this project a focus will be applied on the first step of approaching the problem whereby the area networker will start using the data and create a stronger network between all area networkers.

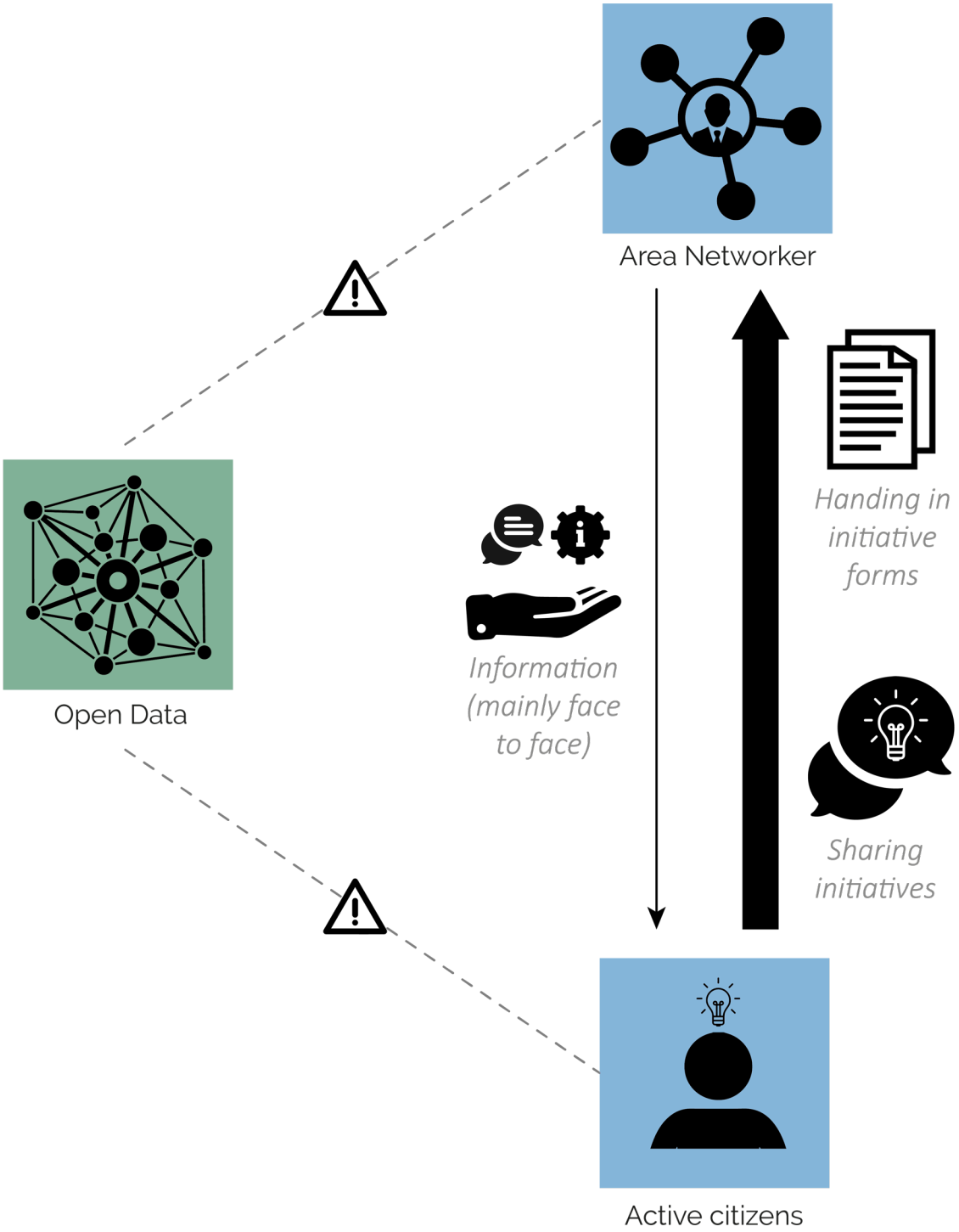

Area Networker
Handing in initiative forms
Information (mainly face to face)
Open Data
Sharing initiatives
Active citizens

Figure 25

THE AREA NETWORKER

Within the first step of approaching the main problem, the area networker is the target group in the first step of approaching the problem. A questionnaire was completed (see appendix B1), to gain a deeper understanding of their function, required skillset, the way they provide support, connect with the citizens and perspective about their thoughts on using data. All insights of the questionnaire are translated into a persona (see figure 26).

In the outcome, all area networkers agreed that the application of data could provide support within their daily responsibilities and definitely could deliver a contribution as one of the area networker's states:

"I think data can deliver a contribution by understanding problems and questions better, but next to the data still human experiences is needed."

Considering this, data will provide support but not take over the role of the area networker. In addition, it turns out that not all area networkers are sharing and connecting with each other very well. If the network between the area networker can be improved, knowledge and a shared understanding can be enhanced. This last aspect is taking in the second step of approaching the main problem. Since at first the area networkers should become confident by applying the use of data by themselves.

The area networkers possess a lot of implicit knowledge (thick data) about their neighbourhood, but do make it explicit nor store this knowledge. In case an area networker is taking over a position in another neighbourhood, the knowledge (thick data) of the former neighbourhood will get lost and taking in the new information within the new neighbourhood will take time to gain a grip on. Furthermore, since the implicit knowledge will fade over time, insights or evidence can be missed. This will result in having direct consequences of the support for the active citizens. Thus, it is essential to provide a possibility to gain a grip on the explicit knowledge to avoid the prospect of losing thick data.

FINAL PROBLEM DEFINITION

Taking in all information and conclusions, a final problem definition is formulated in line with the focus of this project:

There is a lack of making knowledge explicit or stored, which result in losing important insight over time and have direct consequences on support for the active citizens.

RAISON D'ÊTRE

Why should this problem be solved? What value will it bring to all stakeholders? By answering these questions, the values that need to come forth out of the solution are found and can be utilised to create a design goal and finally a value proposition statement.

By giving all stakeholders access to a common language using big data, the network will strengthen. The lack of data stored is mainly referring to thick data. The active citizens of Rotterdam and area networkers are both carrying a source of thick data, knowledge. This knowledge and perspective of added value to their initiatives are mostly expressed implicit and making this explicit will be of high value (Stevens, M., 2015, December 10). Storing this thick data will provide information to the area networkers since they need a lot of knowledge about their neighbourhood. Another important aspect is maintaining knowledge when area networkers transfer to another neighbourhood. The data that is already out there can give the citizens and the area networker a good understanding and grip on a phenomenon. It will make it easier for them to convince the municipality to invest in cases if they have access to data. It will also help the area networkers to spur a meaningful dialogue with peers and active citizens by applying data insights.

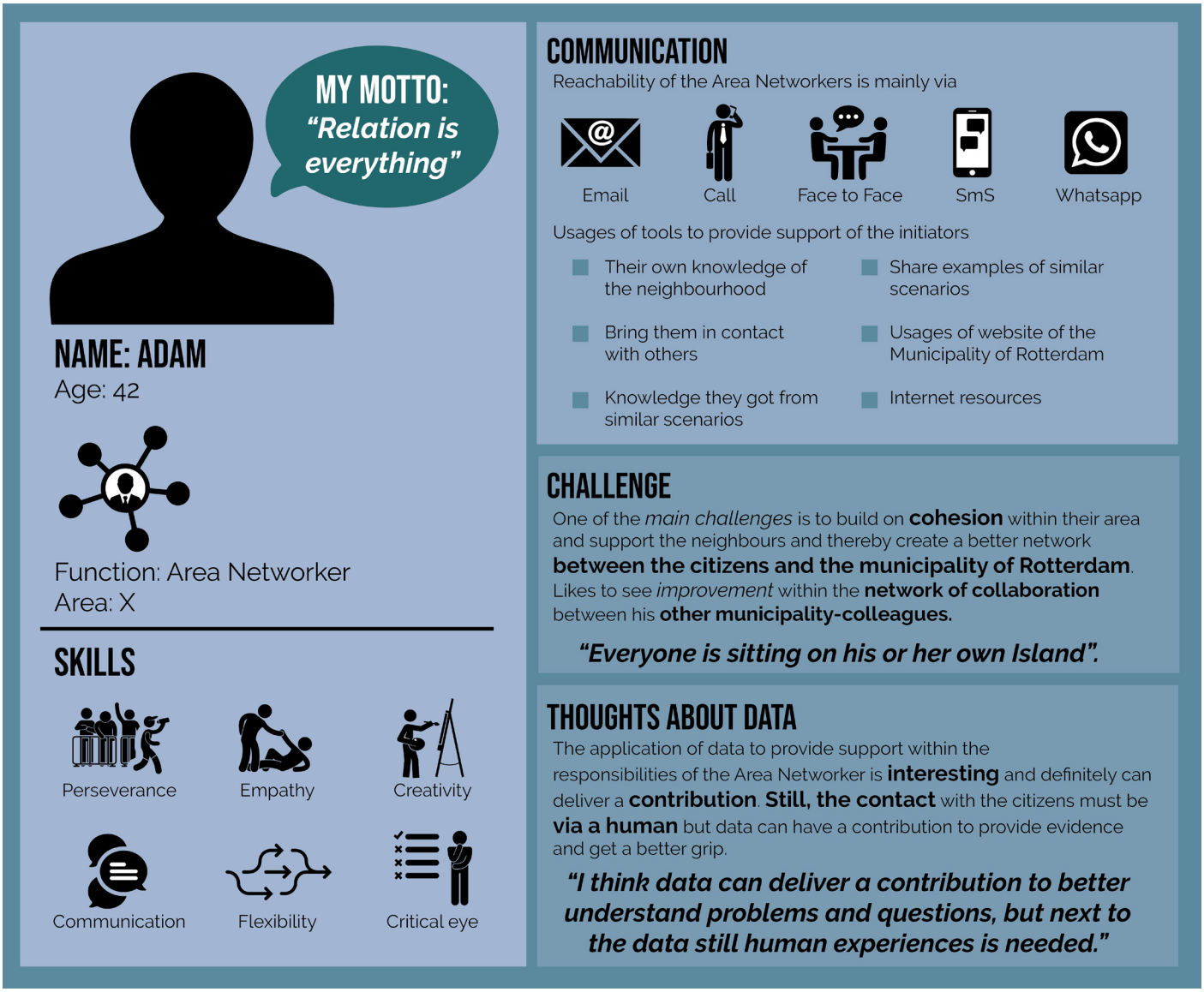

MY MOTTO:
"Relation is everything"
NAME: ADAM
Age: 42
Function: Area Networker
Area: X
SKILLS
Perseverance
Empathy
Creativity
Communication
Flexibility
Critical eye
COMMUNICATION
Reachability of the Area Networkers is mainly via
Email
Call
Face to Face
SmS
Whatsapp
Usages of tools to provide support of the initiators
Their own knowledge of the neighbourhood
Share examples of similar scenarios
Bring them in contact with others
Usages of website of the Municipality of Rotterdam
Knowledge they got from similar scenarios
Internet resources
CHALLENGE
One of the main challenges is to build on cohesion within their area and support the neighbours and thereby create a better network between the citizens and the municipality of Rotterdam. Likes to see improvement within the network of collaboration between his other municipality-colleagues.
"Everyone is sitting on his or her own Island".
THOUGHTS ABOUT DATA
The application of data to provide support within the responsibilities of the Area Networker is interesting and definitely can deliver a contribution. Still, the contact with the citizens must be via a human but data can have a contribution to provide evidence and get a better grip.
"I think data can deliver a contribution to better understand problems and questions, but next to the data still human experiences is needed."

Figure 26

WHAT IS IN THE FUTURE?

The future trend analysis inspires and gives insight into interesting future possibilities to take into account in the design brief. All different trends contain different values, which can be used to form the value proposition in the design brief. Literature research is conducted to find interesting and inspiring future trends. The trends, which are found and discussed are clustered into four topics; data, technology, communication and human lifestyle (see figure 27).

Figure 27

Data has become a highly important source for organisations. New technologies are being developed, what makes the use of data, data production, and processing set new boundaries.

Technology and communication have also made a significant acceleration. New trends can be found in the human environment and surroundings such as the development of smart cities, smart wearables, etc. These are supporting people, and as a result, our ideal self- has become an even more important need to fulfil. Future expectations and developments regarding these trends will be discussed in each cluster.

DATA

No-limitations
As the digitalization of our society will increase dramatically, more data will be collected, become available and transmitted to be used (Deloitte., 2015, April 15). It is expected that zettabytes of data will be produced annually in 2025 mainly delivered by IoT (Salthmarsh, 2017, November 4).

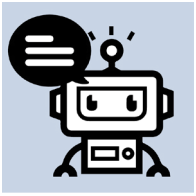
Real-time insights
Generated through IoT (Internet of Things), the stream of real-time data becomes more visible (Saunders, 2017, June 5). Data will be collected by Stream Processing technologies, which provide a better grip and understanding of the data (Saunders, 2017, June 5). As a result, real-time insights will increase the possibilities of responding to changing conditions more rapidly than before.

Privacy and security
Most data holds personal information, which makes the security of this data important. New privacy laws are coming into force, as in May 2018 a significant step was made when the General Data Protection Regulation (GDPR) laws are legalised within Europe Union (Ghosh, 2018, January 2; Rayome, 2017, December 21). Expectations are that more biometric authorizations will be applied to guaranty the security of the devices that are holding personal databases (Babich, 2018, January 2).

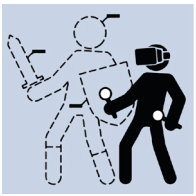
(For more information about the topic data, see appendix B2)

TECHNOLOGY

Artificial Intelligence (AI)
AI is focussed on creating systems in a diversity of forms and shapes, like computers or machines, with the ability to do things that would usually require human intelligence (Van Duin, & Bakhshi, 2017, March 28). By collecting data and create the ability to let the system start learning and understanding the given data, the system can begin to provide support and be part of solving complex challenges (Trevino, 2017, September 11).



Natural Language Processing (NLP)
NLP is focussed on interaction via speaking, hearing and reading (Diepen, Sloet tot Everlo, & El Bouazzaoui, 2017, April 14; Totta data lab., 2017, September 6). Development over time has made it possible to recognize speech, and the ability of AI to provide answers to general questions, well known as chatbots and virtual assistants (Van de Gevel, Broersen, & Wolvius, 2017, May 15). NLP has a lot of potential to assist with data analytics (Tableau., 2017).



Augmented Reality (AR)
The technology of AR has a major application for all kind of different areas like; design, training, collaboration, or media and entertainment (PWC., 2017, November 13). The potential of AR in the future would be to create an ability to see 'what there could be' (Mise, 2017, August 9; PWC., 2017, November 13; Barr, 2017, June 26). As the technology allows us to get easily grip on information and to share thinks and enhance them (PWC., 2017, November 13).

(For more information about the topic technology, see appendix B3)

COMMUNICATION

Interactive Visualisation
The interactivity of the visuals provides an extra component to the data content (Brenner, 2016, October 10). As new techniques allow non-data users to create good charts, this provides the user to explore the data (Lebied, 2017, June 27). Next to using technologies like scrolling and clicking to create interaction, also the command line interface has become interactive, whereby the user commands the computer what to do and the computer interacts on the commands (Bertini, (2017, November 28).

Natural Interaction
By using natural interaction, technology becomes more intuitive towards the users (Accenture., 2017). Making the Interaction with data feel more in a natural way, understanding the data becomes more accessible and more comfortable to use for anyone. The interaction between technology and user will become more personalized and natural, the accessibility gap of users applying data within their work or private life will slowly start closing in (Accenture., 2017).

Storytelling with data
Through storytelling, insights can be uncovered from data that would else be overseen (Analytics Vidhya., 2017, October 18). As from research, it turns out that 74% of organisations in the Netherlands, who are applying data-storytelling techniques, indicate to have a better revenue (Customer Talk., 2017, May 6). Involvement of Technology changes today's storytelling as modern media and machines enhance the stories into a surreal environment and make a story literally come alive (Trevino, 2017, September 11).

(For more information about the topic communication, see appendix B4)

LIFESTYLE

Smart City of the future
Around 60% of the people are predicted to be living in cities in 2030 (Philips Lighting., 2018). Technologies like AI, IoT and algorithms will play an important part to establish a new wireless network of smart devices which makes the urban dynamics change on all kinds of different levels (Jaquith, 2017, January 18; I-Scoop., 2017; Philips, 2018, January 21). Sustainability, health, and psychology will have the overhand to steer this future development (Jaquith, 2017, January 18; I-Scoop., 2017).

Wearables
Expected is that in the year 2020, nine million out of the total population of the Netherlands will be owning a smartwatch (PwC., 2016a). Research has concluded that the reason why people are using wearables is mainly to manage their time more efficiently, but also have control and insights over personal data (PwC., 2016b). In addition, these devices are becoming affordable for everyone (PwC., 2016a). Expected is that wearables, next to person usages, will start to play a role within different kinds of industries like healthcare and mining (Mardonova, & Choi, 2018).

Ideal of happiness and quality of life
Our happiness satisfaction has a strong correlation with the amount of income, having a good job, freedom, honesty, generosity, a trustworthy government, social support and health (Ortiz-Ospina., Roser., 2017). A significant development is a focus and consciousness of our health and wellbeing (Trend Watching., 2016, April; PwC., 2016b). Contributing to the popularity of Smart wearables types, whereby 45% of the smart wearables owned are fitness trackers (PwC., 2016b).

(For more information about the topic lifestyle, see appendix B5)

CONCLUSION

The trends are all containing essential values, which are interesting to use for the value proposition statement. All values found for each trend are written down to get an overview of overlapping values, to see the essential values within each trend cluster. The values that are overlapping within each trend cluster are compared to each other whereby the most frequent values overlapping most trend clusters are selected and considered the most important values. This resulted in the following main values: comfort, connect, control, optimize, support and understanding (see figure 28).

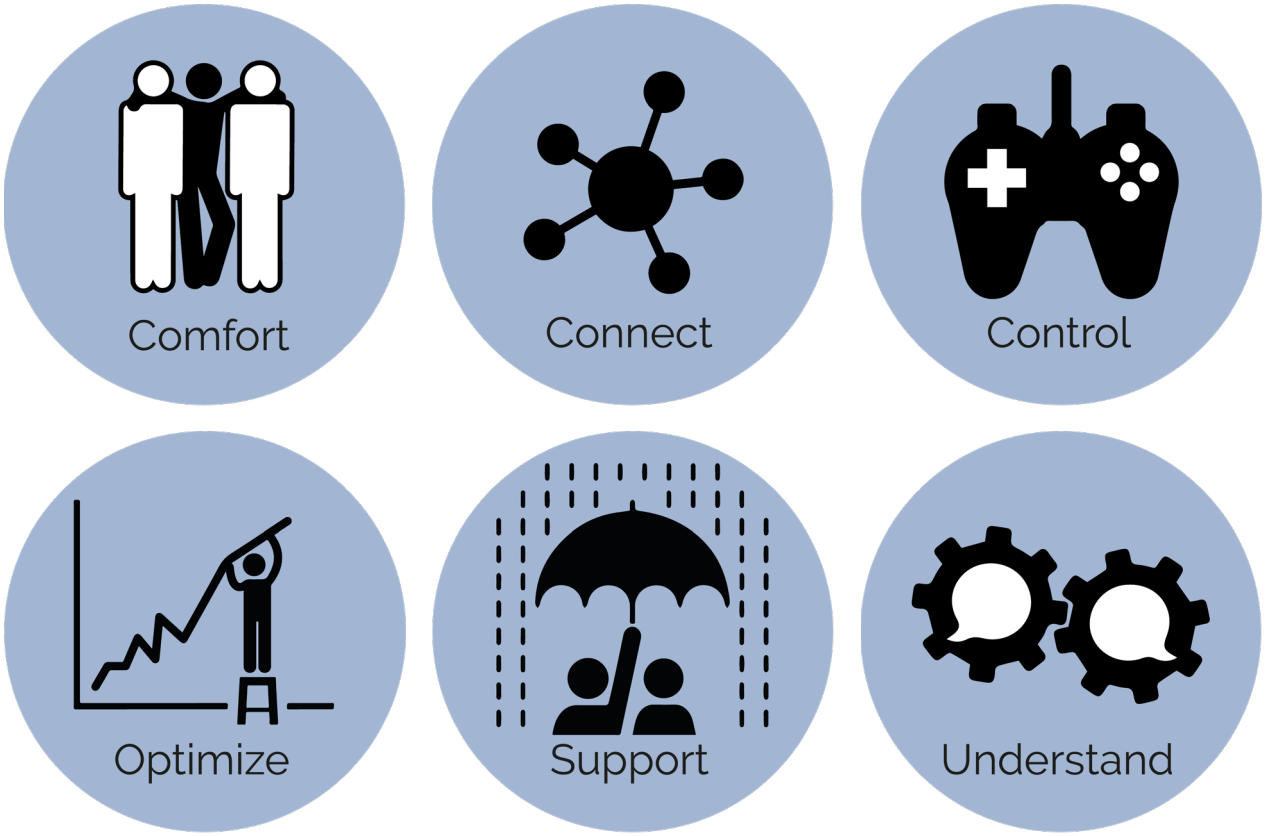


Figure 28

ANALYSE

DESIGN BRIEF

The design brief is formulated and defined by all insights from the previous parts. The design brief first describes the design goal to make a clear what is needed to be achieved. To certify the goal, a list of criteria is created and at the and a value proposition statement is formulated which take in future perspective values within the topic of data, technology, communication, and lifestyle.

DESIGN GOAL

The design goal is to make data tangible to be used by the area networkers whereby the design goal includes three aspects; which are making data tangible to use, explicit data implicit by collecting the data and, merging big and thick data. Including all three aspects the design goal is formulated as followed;

How to make data more tangible for the area networker and thereby get him/her familiarised with using data, aiming to provide a more effective output in their daily work.

CRITERIA

The criteria are based on the insights found and are created to provide a starting platform for the ideation. The criteria list is divided into sections regarding the user, tool experience, privacy and security and, data usage.

User

- The area networkers of Rotterdam will be the main users of the solution
- The solution communicates in a language, which is easy to understand for the area networkers.

Tool experience

- The solution must be easy to access
- Provide support for the area networker within their responsibility
- Provide a better understanding of the area networkers' neighbourhood
- The solution must be accessible via mobile, tablet or computer

Privacy and security

- The data can only be edited by area networkers
- The data can only be added by area networkers
- The solution is only accessible for employees of the municipality of Rotterdam
- The solution is accessible by using biometric authorization

Data usage

Storing of data

The solution provides the ability to collect thick data by the area networkers

The ability to collect data needs to be accessible for the area networkers

Output of data

The solution provides insights in the neighbourhood

The output must give a clear overview of the data collected

The output must be easy to understand by the area networkers

The output must be adjustable by the area networker

The output provides critical feedback on the phenomena

VALUE PROPOSITION STATEMENT

The values found in the persona, final problem definition, and future analyses are translated in a grounded value proposition statement:

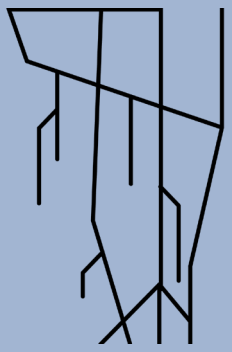
"Make data as tangible as 'Wikipedia' with the possibility for the area networker to find and add information to provide more comfort and control of data usage to optimize thereby the connection, understanding and easier delivering of support for their neighbourhood."

Wishes:

Adding the thick data using minimum effort

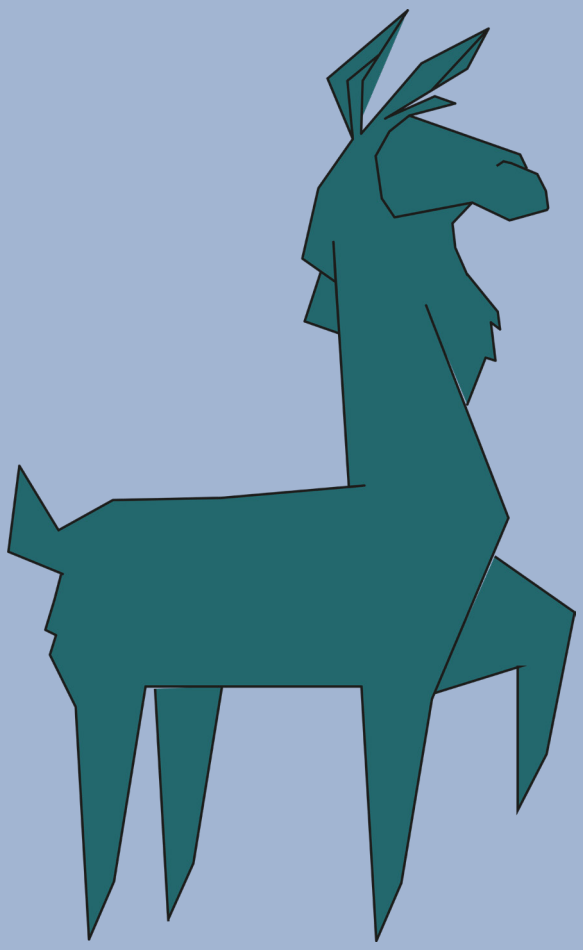
The thick data must be transformed automatically to the right category/theme/ keyword

Adding notes by using voice recording into text



Exploring
& creating
design solution

CREATE



INTRODUCTION

With the gathered knowledge, the process continues with the next chapter 'Create.' In this chapter, the final concept, L.A.M.A., is introduced. All main insights of the previous chapters are collated and taken in to create the conceptualization process of the final concept proposal. First, the conceptualization process will be described to show the process towards the final concept proposal. In the end, the final concept proposal will be described and explained in depth.

IDEATION & CONCEPTUALIZATION PROCESS

Aspects that play an essential role in how to collect data use the received data and which data to collect are further explored within the conceptualization process. To gain a clear sense of these aspects, two creative sessions where held and after building further on the inspiration and outcome of the creative sessions, ideas were created by using the how-to method.

CREATIVE SESSIONS

Co-creation is a team effort of open collaboration between stakeholders to work together to develop a product or service (Fronteer., 2009). Share insights, inspirations, ideas, and strategies make it possible to provide a fresh perspective, touch new key points and connect customers, consumers and partners to deliver new ideas and opportunities (Crandell, 2016, 10 June; Fronteer., 2009).

Two creative sessions were held, whereby the first creative session was focussed on what kind of forms the solution could have (for impressions see appendix: C1). The second creative session was a co-creation to gain insights and idea perspectives of the users (the area networkers) and designers (Master students from the TU Delft Industrial Design Engineering)(for impressions see appendix: C2).

Session One

The first creative session was held with only designers, as they do not have any knowledge of the challenges or issues of the area networkers. With this, the group is more open-minded towards the problem. A brief presentation about the topic, the problem and network were given to inform the participants to define a clear challenge and explain some rules to provide a better outcome (Fronteer., 2009). The goal of the first creative session is:

Provide insights of how the solution could look like.

During the ideation, the participants challenge the outcome. One group was not allowed to use images or pictures. The other group was not allowed to use text to display data. In this way, different ideas came out of the sessions, which inspire the final concept.

After the ideation, the most interesting ideas were selected, and the groups were divided into two teams to work out the ideas. Two concepts were created namely Rotterdam Data and Transcube (see figure 29a and 29b). Both ideas are making use of categories to find data and ability to 'zoom in' or 'out' to define the area level. An overview of the most important outcomes of the session that was presented are:

- All ideas turned out to be completely digital
- The ability to working in different categories and levels of the area at the same time.
- Usage of categories/themes/subthemes, etc.
- The importance of being able to go into detail or zoom out (individual, household, street, neighbourhood, area or Rotterdam).
- Search option(s)
- Level of priority of issues identified
- Questions about how to handle privacy and security

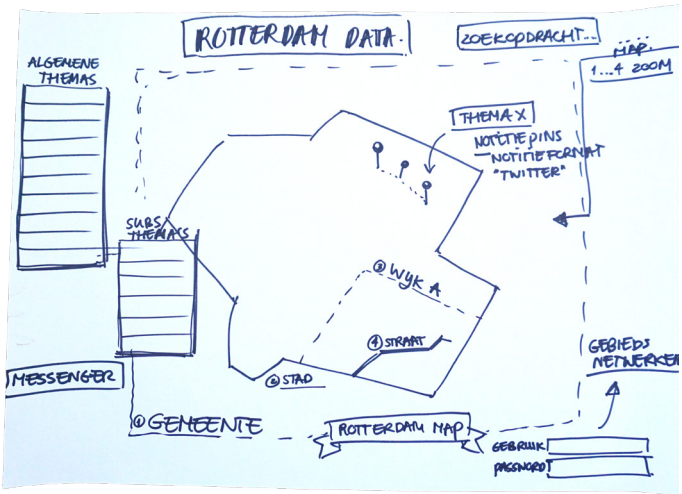


Figure 29a

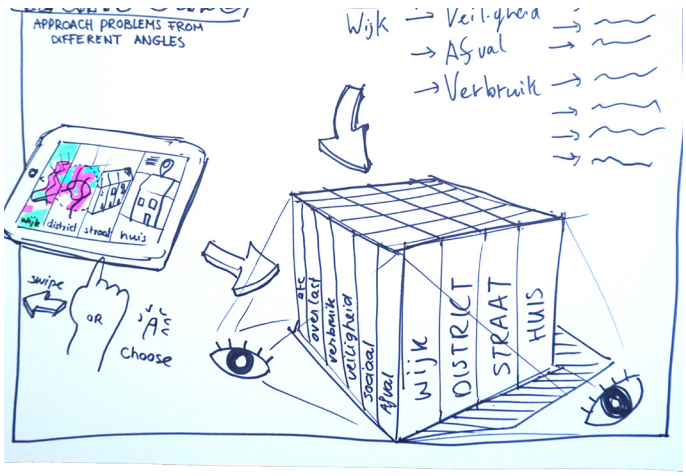


Figure 29b

Session two

The second creative session was held with two designers and two area networkers. To eliminate any bias during the session a Master student of TU Delft Industrial Design Engineering facilitated it. The session started with a short warming-up to understand that keeping knowledge by heart does not guaranty that this knowledge will be held in your/the mind forever and as Dick Swaab (2016) states:

"Each time you retrieve a memory, you can modify it again."

In addition, the warming up was used to create a discussion, which during the session had a positive outcome as it resulted in a better team spirit as not all participants knew one another and did not share the same background and expertise. The goal of this session is:

Find interesting thick data to store and how to store this data.

During the start of the ideation, duos were formed consisting of one area networker and one student. A scenario was given whereby the area networker was be replaced by a student who takes over of the work of the area networker. The challenge was to let the area networker inform the student of the neighbourhood. After the discussion, the students had to pick out the three most important aspects. These aspects were discussed with everyone and narrowed down to six points:

1. Getting in connect with the people of the neighbourhood.
2. Neighbourhood level is not specific enough.
3. Problems are still not visible for the area networkers.
4. The area networkers connect with the staff of the neighbourhoods by addressing them as 'Rotterdammers' (citizens of Rotterdam).
5. Focus on individual
6. How to use/find/apply big data?

After more ideating on the six points in more depth, the group was again divided in duos (one student and one area networker). Each team was free to use the output from the scenario and ideation to create the ideal tool. The two ideas that come out were completely different. The first one was more focused on storing thick data easily and merge it with big data. The second was more focused on getting people together on a long-term approach (see figure 30a and 30b). Interesting outcomes of the session:

- The need for merging big and thick data
- It would be nice if the tool would automatically transform the thick data into a good overview of the data.
- It would be interesting to have the ability to add an importunacy rate to the stored thick data.
- Data provides an extra critical view of what is really going on

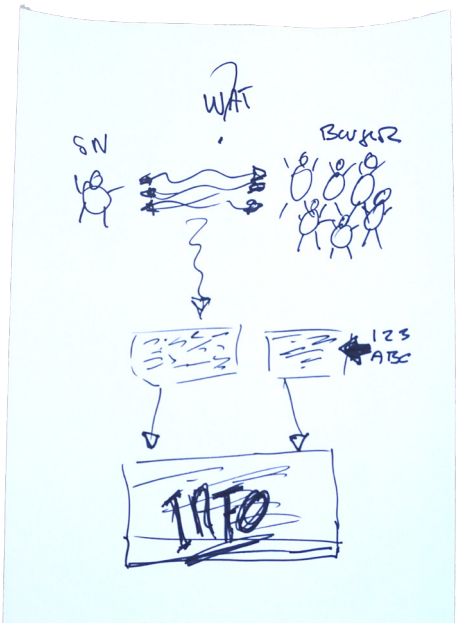


Figure 30a

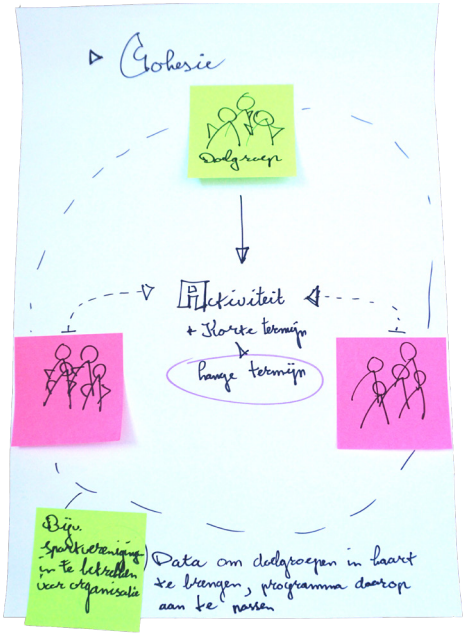


Figure 30b

Main take out of both creative sessions

The creative sessions indicated essential aspects, which are needed to take into account for designing the final concept. As the criteria already included some of the important outcomes of the sessions. A few important points were added:

- The ability to add priority of importance to the thick data
- The focus on complete digital tool
- The ability to be able to use it anytime, anywhere
- The ability of working in different categories/labels
- To provide a good and automatically overview of the thick data
- Providing an extra critical view of what is really going on

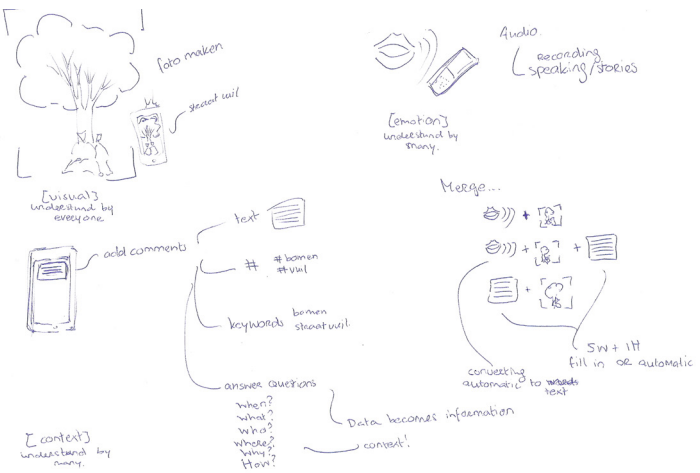


Figure 31,1

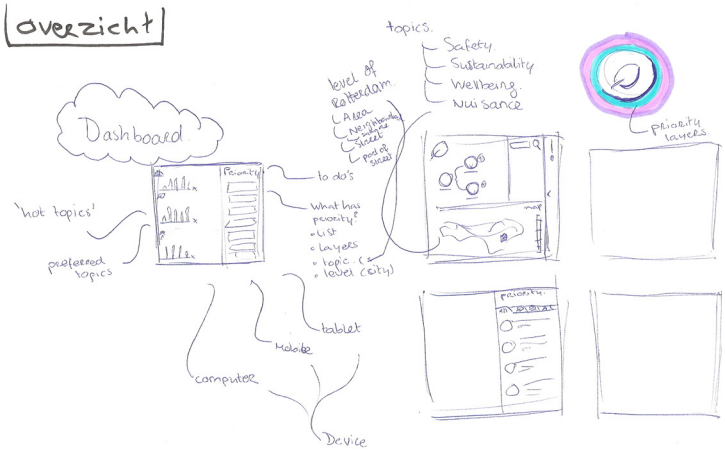


Figure 31,2

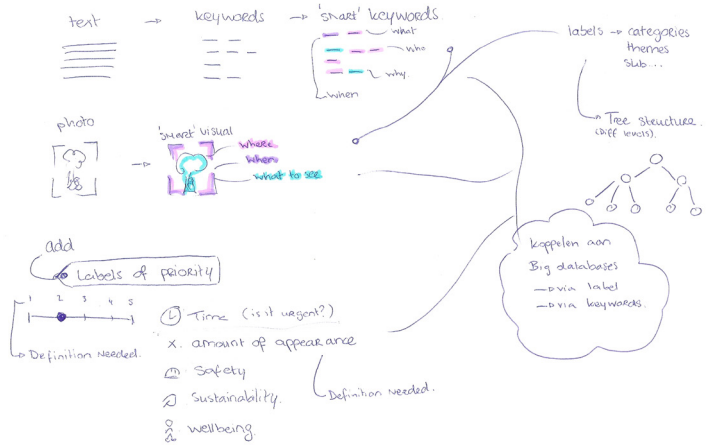


Figure 31,3

CONCEPT IDEAS

In elaborating on the outcomes and insights of the creative sessions, the how-to method is used to create ideas for different aspects of the final concept. The how-to's which are created can be seen in figure 31.1, 31.2 and, 31.3 (How can you collect data? How can you process the data? How can you create a good overview of the collected data?). After creating the different how-to questions the options were discussed with citizens and students with a technology or designer background.

The outcome resulted in a merger of the take out of the creative session, previous main insights and implementation of the model of Naude (2016). The merger occurred in two process cycles where the first cycle data is being stored, shown in an overview and knowledge being taken out. To elaborate on complex questions and ability to gain a better critical view, a second cycle is added which allows the area networker to get in contact with a data analyst within the municipality of Rotterdam. Together they can discuss, based on the data collected and big databases of the municipality, to gain a critical perspective of the phenomena.

CONCEPT PROPOSAL: L.A.M.A.

L.A.M.A, which stands for Local Area Monitor Assistant, offers support for the area networker in Rotterdam in gaining knowledge of observations in the neighbourhood by storing and providing an overview of data collected by the area networker. As a result of this L.A.M.A. can be seen as an external hard drive in addition to the memory of the area networker. The impression of the application can be seen in figure 32.

The core principles of L.A.M.A. is to **support** of gaining knowledge of the neighbourhood and thereby better **understand** what is going on by analysing the observation data that is collected. All data collected is translated into dashboards to give an overview of the observation data to provide a feeling of **control** over the observation data and enhance a **comfortable** way to explore the data in depth. Getting in **connect** with the data analyst of the municipality of Rotterdam to compare the big databases to provide an **optimization** of the explored patterns and insights to gain a better perception of the actual reality and thereby result in a more critical approach of the data conclusions. A total overview of the processes of L.A.M.A. can be seen in figure 33.

L.A.M.A. is divided into two cycles, the first cycle is the support loop and the second cycle is the critical feedback loop. L.A.M.A will be described in more depth per cycle with the following phases (support cycle: collecting observations, an overview of observations, knowledge of observations and critical feedback cycle: knowledge of observations and feedback on the reality of the observations). In addition, devices usages, the role of privacy and security, a description of two scenarios of L.A.M.A., flowchart and interaction of L.A.M.A. and, the benefits for the stakeholders will be discussed.

Figure 32

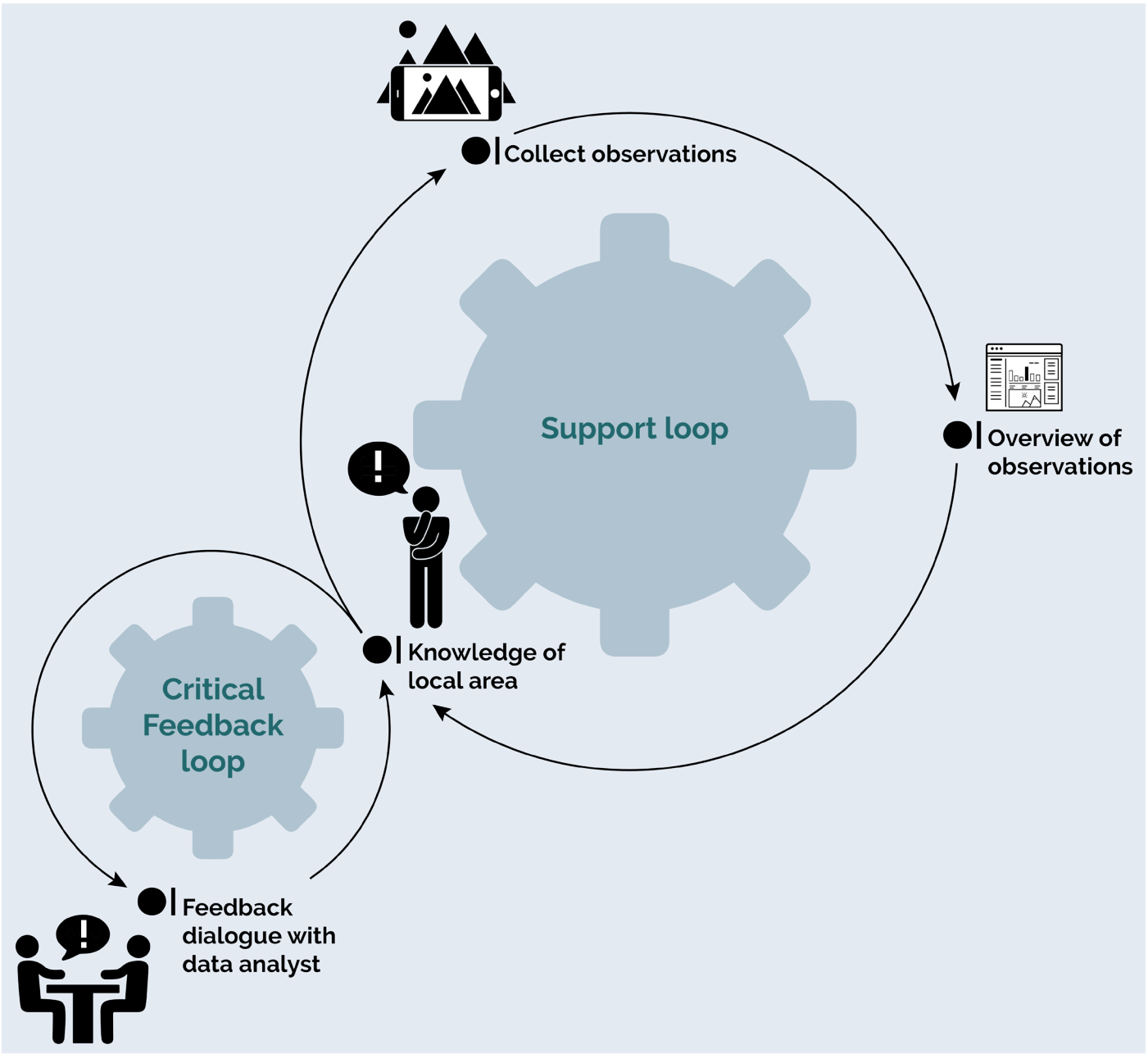

Collect observations
Support loop
Overview of observations
Knowledge of local area
Critical Feedback loop
Feedback dialogue with data analyst

Figure 33

SUPPORT LOOP CYCLE

Delivers: enhanced knowledge of the observations of the neighbourhood.

Process: First, the observations will be collected using photos including a short description (see figure 34). The collected data is translated into diagrams and maps which can be found in a dashboard and gives an overview of all collected observation data. The overview of these dashboards offers support to the area networker to gain more knowledge by exploring new patterns and insights of the neighbourhood.

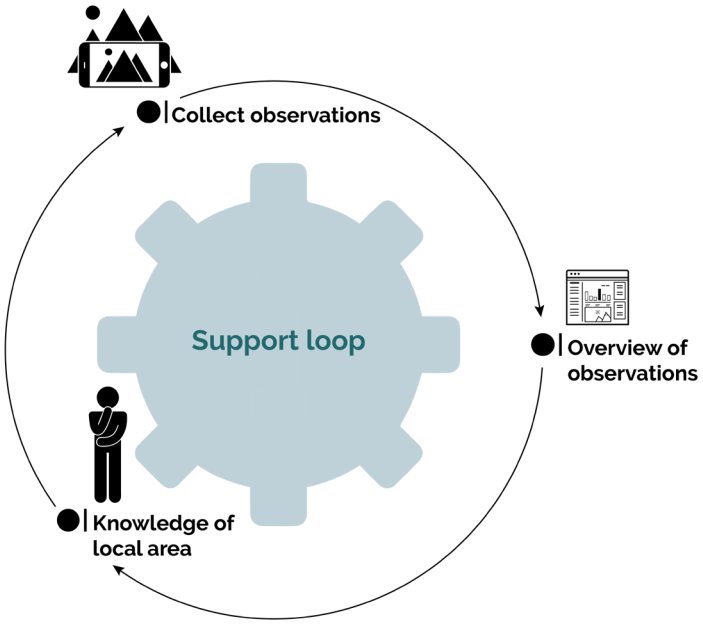


Figure 34

Collecting Observations

When the area networker is walking in the neighbourhood, observations can be collected quickly and easily by making a photo of the observation with a smartphone or tablet. This phase contains three aspects; information, labelling of observation data and priority of observation data.

Information

To gain useful knowledge from the observation data, relevant information about the observation is stored along with the photo. This information will answer the 5W's (When, Where, What, Why and Who) and 1H (How). In this way, the observation contains the required data to provide sufficient information about the subject and information about the observation is made a uniform to cross-reference observations and provide an overview.

The metadata which the photo contains such as place (where), visual recognition photo (what) and time and data (when) are automatically stored. The other information aspects: Why, Who and How can be added as a short description alongside the photo.

The area networker must first login before he/she can take a photo to capture observation data. However, since a phenomenon can happen quick or by surprise, the area networker can take a picture using their mobile phone or camera or ask others to send a photo to be added later via the application. Making this transferring of photos possible makes the usability quick and easy. In addition, collecting by making photo's makes the application more approachable for anyone to be understood and used. Furthermore, misunderstanding upon the collected data will be further avoided by the support of labelling and addition notes.

Labelling of observation data

To translate the data directly into topics, the area networker must add a label to the observation data. The use of labels will make the structure of stored data more tangible and concrete. The area networker has de ability to add labels to provide some personalised freedom of working with the labels. Suggestions of possible labels are given based on the picture (see figure 35) that the area networker took and during typing, based on the text for the label. The technology reference is comparable with the search technology of Pinterest (see figure 36.1 and 36.2). Next to the labelling of the data, notes can be added for further description or support of the photo.

Directly picking-up the phenomena of the observation data

Next to labelling of the observation data, an indication of the phenomena must be pick-up directly can be added to a to-do list. When a phenomenon is preferred to picked-up later, the user can set a reminder for later that same day or later in de week. L.A.M.A. thereby plans a reminder on the agenda to handle the to-do later on. In

this way, L.A.M.A. gives support in scheduling the agenda in the best way, what results in giving a reminder and having time scheduled to handle the to-do directly.

Observation data interesting and up for discussion

Not all observation data collected can directly be processed and handled. Some data just gain knowledge but when patterns start showing up data can become interesting to analyse further. In case the area networker has the interest to start analysing these data, he/she can give an indication to the data marked as 'Pick-up for discussion' ('ter discussie stellen'). This indication provides the ability to start to stimulate a dialogue between the area networker and data analyst of the municipality of Rotterdam. Data found can be shared during a meeting, which the area networker can directly schedule by using the L.A.M.A..

Overview

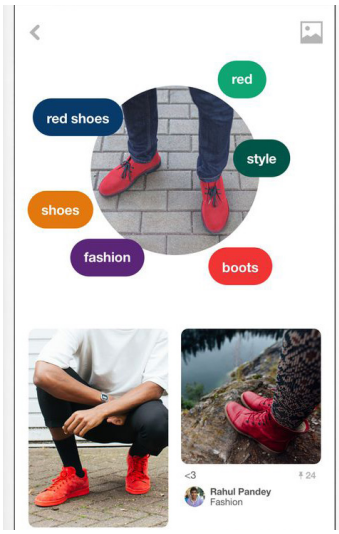
All the collected observation data is transformed into a dashboard. The dashboard provides a clear overview of the observation data on a monthly, weekly, daily or in parts of a day (morning, afternoon, evening and night) bases. Next to time indication, actual GPS location is used to store the observation location on the map of the neighbourhood. By using filters, only specific observations will be displayed to search patterns and insights. In addition, by using dates of the observations, history can be displayed over the years and in turn be compared to present time. The collection of observation data of a neighbourhood can be translated by L.A.M.A. to create diagrams and maps. These ways of visualisation of data can be customized to be able to a get grip on data in a comfortable way and explore new patterns and insights. To create a user-friendly dashboard, the labels as discussed in the previous phase will make it easier to find and organise the data for the area networker.

Since all the observation data is labelled, dashboards can be presented per label to gain a good understanding of the situation. Besides displaying different dashboards per label, the observation data can be tagged with priority indication. An overview of the data with the highest priority and amount of related similar observations can be seen on the priority dashboard overview. And both selection criteria can also be combined by filtering the observation data by label and priority indication.

Knowledge

The overview provided by dashboards allows the area networker to gain knowledge of the observed data in the neighbourhood. By exploring the observation data, new patterns and insights can be discovered which provide the area networkers with knowledge of the neighbourhood.

Figure 35



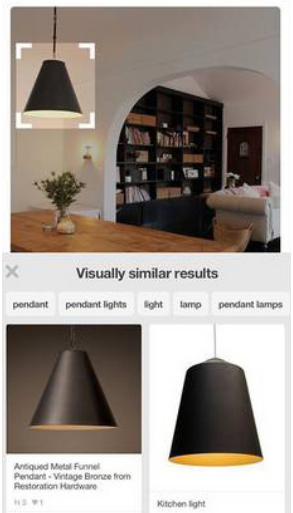


Figure 36.1 and 36.2

CRITICAL FEEDBACK LOOP CYCLE

Delivers: a meaningful dialogue with a data analyst to compare big databases of the municipality with the observation data provided by L.A.M.A.
(see figure 37)

Process: When new patterns or insights are found, the area networker can use the dashboard as a support to prepare a meaningful dialogue with a data analyst of the municipality of Rotterdam to compare the patterns or insights with big databases of the municipality. This process helps in obtaining a critical analysis of the observed patterns and perceptions resulting in a better and more realistic image of what is really happening.

Knowledge

Each display can be saved in several file formats to allow the area networker to prepare for the critical feedback if desired.

Critical Feedback

The saved dashboards will help the area networker to get a meaningful dialogue with a data analyst of the municipality of Rotterdam by comparing the observed patterns and insights with the big databases of the municipality. The result of this meaningful dialogue is a subjective and critical view on the observation patterns and insights and thereby assess whether the observation data reflects the actual reality.

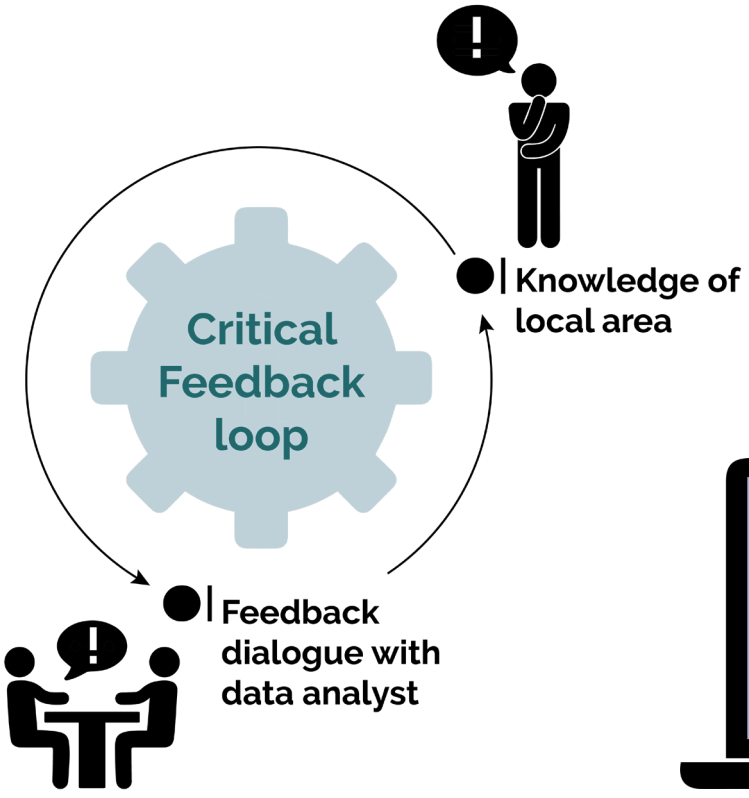


Figure 37

Figure 38

DEVICES

The application L.A.M.A can be used on a computer, tablet or smartphone (see figure 38). The possibility to use it on multiple devices allows users to choose a device of their preference. This allows for quick access of the application and freedom in the movement. For example, the tablet and computer can be considered as more tangible to view the dashboards or add notes, while both smartphone and tablet will be mainly used to collect data out in the field. The application relays mostly on the usage of the smartphone what might seem to be a barrier. But reports clearly show results that in 2017 93% of the Netherlands owned or had access to smartphones (Deloitte., 2017). Predicted is that in the amount will continue to increase, what makes the device could have just a rather small till no influences on the threshold (Deloitte., 2017).

PRIVACY AND SECURITY

The application function is chosen to create a secure platform to store photos and observation data safely. In addition, it is very important that the collected observation data is secured. Therefore, the area networker is the only one who has access to the observation data by using fingerprint access to open the application and photo storage. When using the application for the first time, the area networkers need to register themselves. This can be done by filling in their work email address, scan a finger to access and create a password as a back-up when a finger scan is not present to be used to access (see figure 39.1 to 39.3)(for example, not all tablets or computers provided have a finger scanner). The data diagrams and maps are open to being viewed by or being shared with other municipality colleagues since these will not show any personal data of the citizens directly. For further protection of the citizens, faces will be automatically recognized and will be blurred.

Figure 39.1, 39.2, and 39.3

SCENARIO

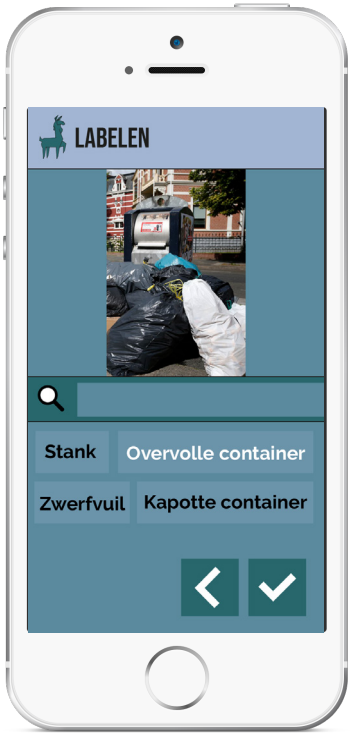
Two scenarios have been created to demonstrate the complete process of L.A.M.A., how L.A.M.A. is used and its potential appearance in reality. The first scenario is a quite common phenomenon, hereby a scenario is made about domestic waste (see figure 40). The second scenario is a phenomenon, which is interesting for a discussion with a data analyst and concerns how children play on the streets. This is often not the safest place and annoys other residents due to noise or the potential for damaging parked cars (see figure 41).

The area networker walks through the streets of his neighbourhood and sees trash around the trash containers.

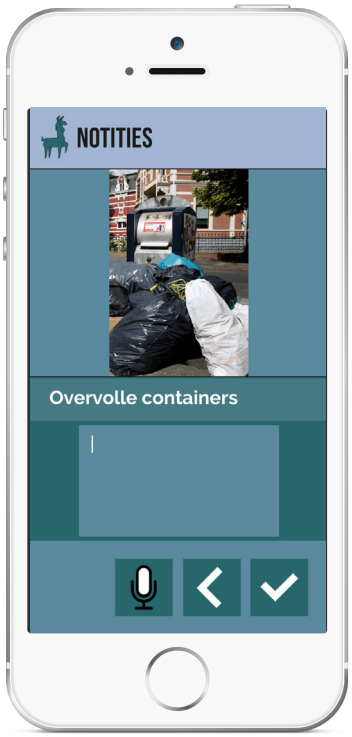
The area networker wants to collect his observation and makes a photo.

The application screens the photo and conclude that the area networker has already made a similar observation last Wednesday. The application will then ask if the area networker would like to submit the same notifications as the similar observation. The area networker chooses the option to submit the same notifications and goes through them to see if he still agrees with all notifications.

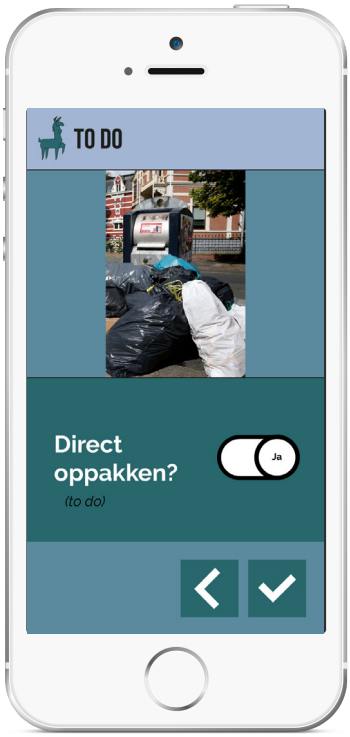
Figure 40: Overflowing container



The area networker still agrees with the title: 'overloaded containers' (overvolle containers)

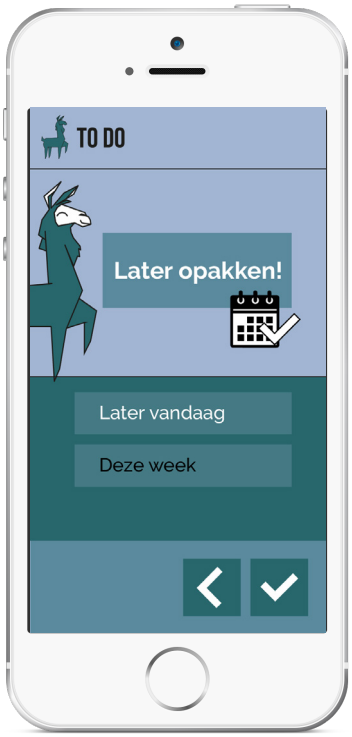


There were no notes taken last time, as the area networker also agrees to add no further notes.

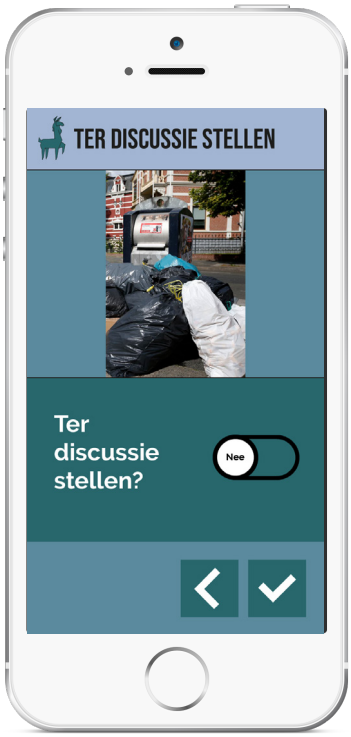


As L.A.M.A. reminded the area networker that he already has seen this phenomena last week, the area networker decides to pick it up directly (direct oppakken)

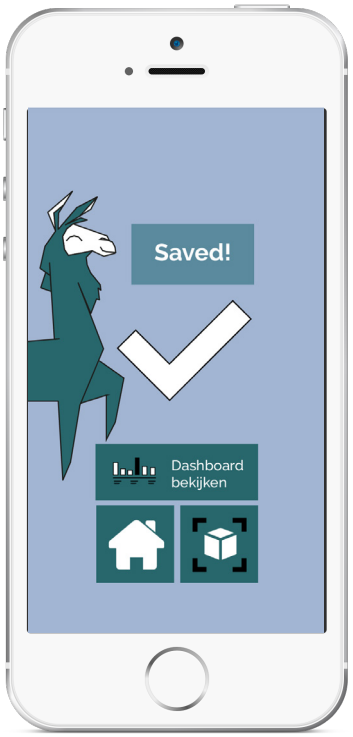
Unfortunately, the area networker does not have direct time to pick it up and plans in a reminder to pick it up later.



The area networker chooses to pick it up later today, as he knows it will cost just a little effort to send a notification to the right person but has planned to pick up all to-do's later today.



The area networker knows that this observation is very clear and has no need to be further discussed together with the data analyst.

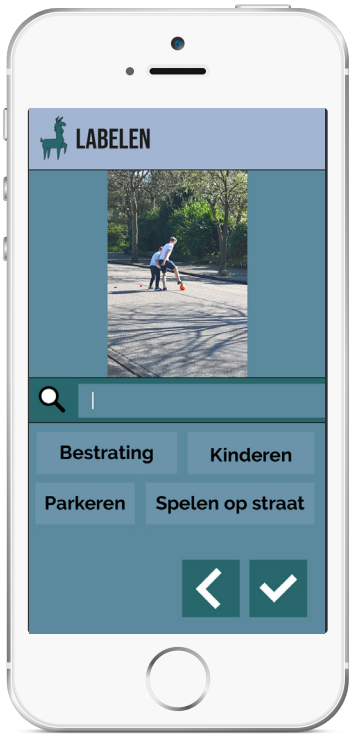


The observation data is saved!

Sometime later that day. The area networker receives the reminder and picks up the to-do.

The area networker walks through the streets of his neighbourhood and sees children playing outside. He sees this phenomena quit often and want to collect the observation.

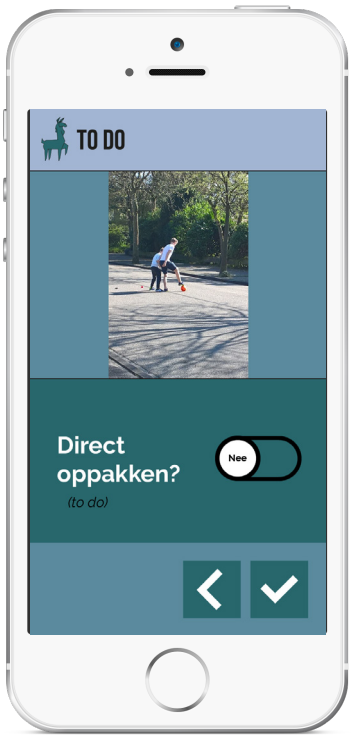
The area networker takes a photo.



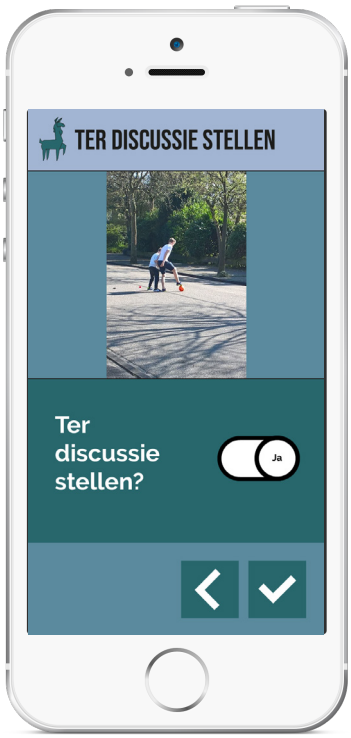
The area networker sees that L.A.M.A. has made a view labelling suggestions but the area networker likes to make a combination of the suggestions and types in the title: 'Children play in the street' (Kinderen spelen op straat).

Figure 41: Children play in the street

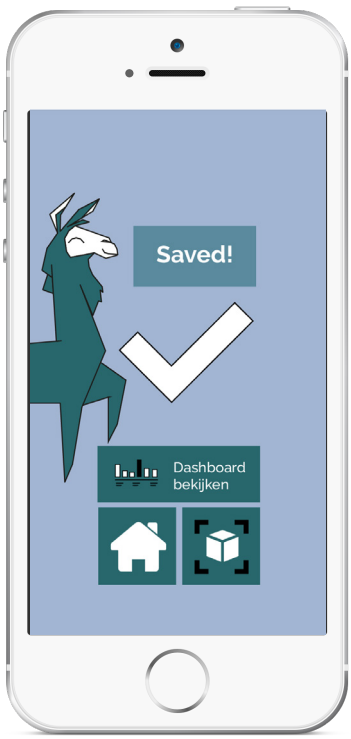
The area networker also adds notes to the observation to make clear why this is rather interesting in his point of view. The area networker notes by using the voice recorder, which automatically translate voice to text. “Playing in the street is dangerous for the children”, “playing soccer can cause damage for the cars”, “Maybe the playground should be redesigned to make room for these children to play”.



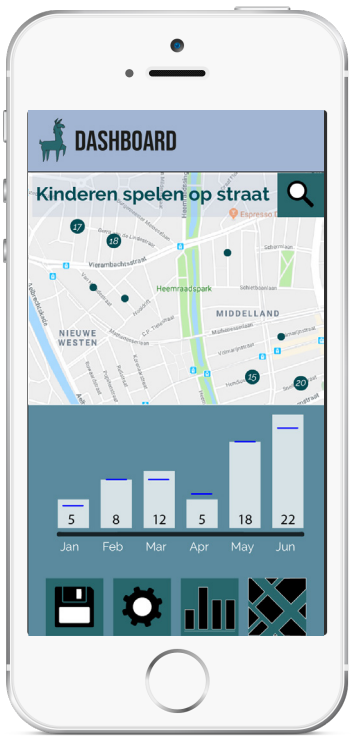
The area networker does not want to pick the observation up directly.



Since the area networker has seen this observation before, he would like to but it up for discussion.



The observation data is saved. The area networker is interested to see all he observations in the dashboard and chooses to see the dashboard of this label.



The dashboard makes clear to the area networker that this observation has been noticed a few times already this year.

The area networker thinks it is time to see if he can take a next step and want to make an appointment with a data analyst to disuse the observation data, maybe it is time to redesign the playground already. The area networker click on the 'put up for discussion' (ter discussie stellen).

He selects the data he has given the notification of 'put up for discussion'.

He sees the diagram again and thinks it would be good to share it with a data analyst and make an appointment.

An overview is given were the area networker can see when he has time in his agenda and when the data analyst has time to make an appointment. The area networker chooses to make an appointment for Wednesday June x at 2:00 - 3:00 PM.

The appointment is made and saved in his calendar.

Later that Wednesday in June X at 2:00 - 3:00 PM

FLOWCHART OF SCREENS

An overview of the flowchart of main screens of the L.A.M.A. application is represented in figure 42. The overview displays the main screens and functions. (Not all screens for the possible options are shown since this is a concept proposal demonstrating the main features of the application itself.)

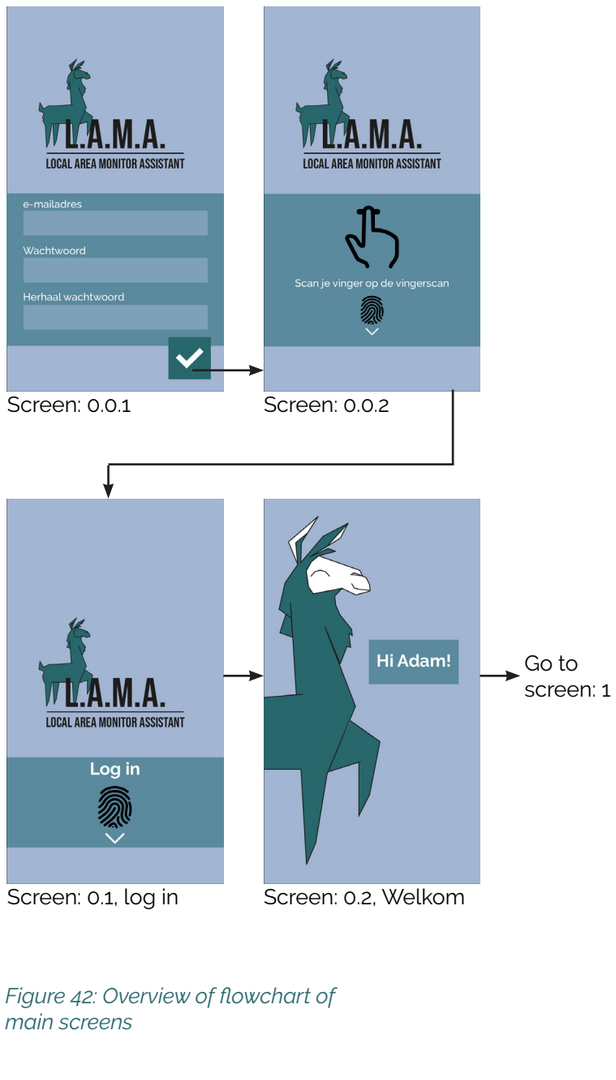
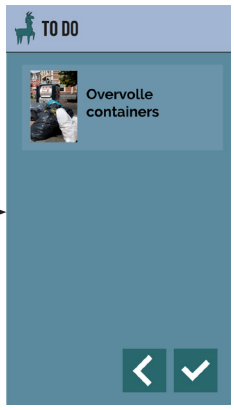


Figure 42: Overview of flowchart of main screens



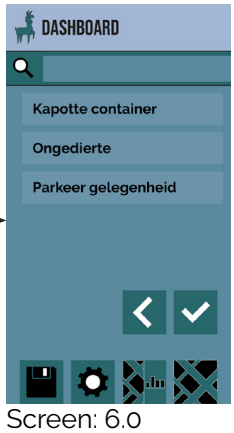
Screen: 4

Screen: 5.0

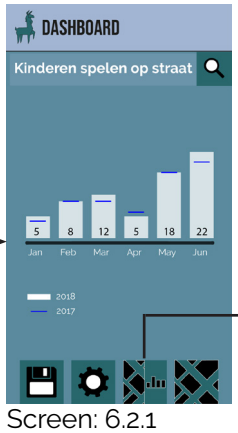
Screen: 5.1

Screen: 5.2

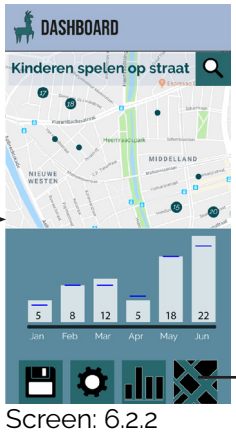
Screen: 5.3



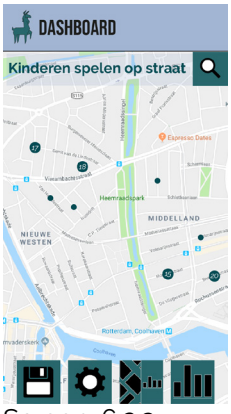
Screen: 6.0



Screen: 6.2.1



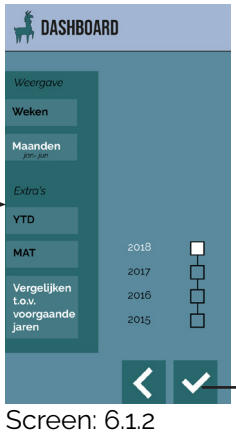
Screen: 6.2.2



Screen: 6.2.3

Screen: 6.1

Screen: 6.1.1



Screen: 6.1.2

INTERACTION OF SCREENS

The interactions for the screens are described in the figures 43.1 to 43.14. Screens with a similar interaction are mentioned along with the explained screen. The interaction hand gestures for the screen are explained in figure 44. On the left side of the hand gestures, coloured circles are presented which are used to remark the spaces within the screen where this action tact place.

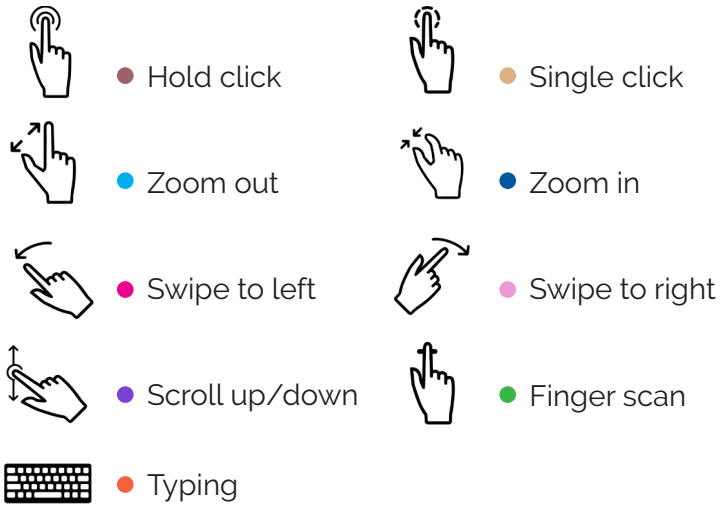


Figure 44

Screen 0.0.1
Interaction points:

Click on the check mark to confirm

Type your own e-mailadres, create password and repeat password

Screen 0.0.2
Interaction point:

Scan a preferred finger and repeat it a few times.

Figure 43.1 and 43.2

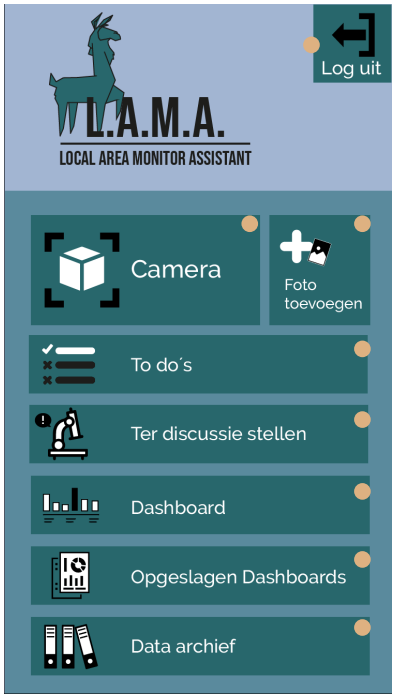
Screen 0.1
Interaction points:

Scan your finger to log in.

Screen 0.2
Interaction points:

No interaction needed, after a few seconds the screen automatically continues to the main menu.

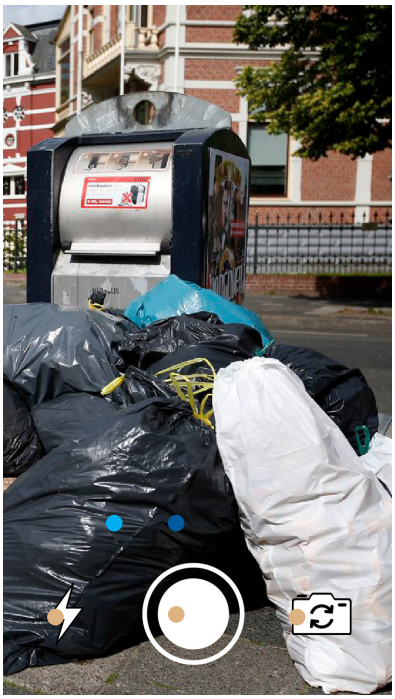
Similair principles for screen: 5.3



Screen 1
Interaction points:

Click one of the menu options or log out.

Similair principles for screen: 2.1, 2.2.1, 6.1



Screen 2.0
Interaction points:

Zoom camera out

Zoom camera in

Click to; controle the flash light, take a photo or switch to the other camera

Screen 2.2.2.0
Interaction points:

Click to; use a suggested label, go back or okay and next (check mark)

Type your own label

Screen 2.2.2.1
Interaction points:

Click to; go back or okay and next

Hold to use the voice recorder

Type your notes

Figure 43.3 to 43.8

Screen 2.2.2.2
Interaction points:

Click to; go back or okay and next

Swipe to left to mark as not picking it up directly

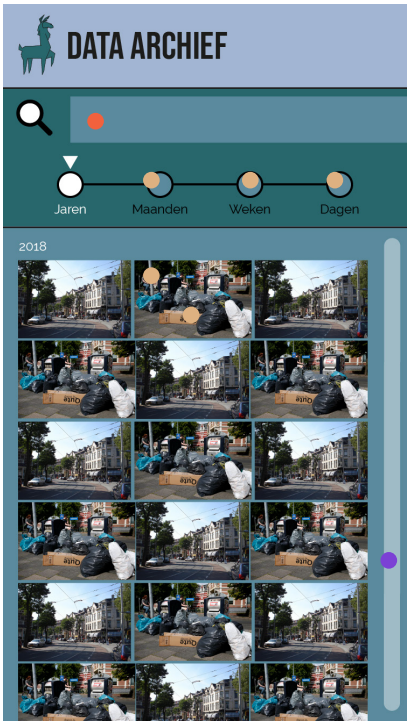
Swipe to right to mark as yes, picking it up directly

Similair principles for screen: 2.2.2.3

Screen 5
Interaction points:

Click to: select the data you are intested in, go back or okay and next.

Similair principles for screen: 2.2.2.5, 2.2.2.5, 4, 5.1, 5.2, 7



Screen 8
Interaction points:

Click to; go back to the homepage, to sort the photo's or open a photo to see further details

Scoll up and down to go through the photo's

Type the label of the photo you are looking for

Figure 43.9 to 43.14

Screen 6
Interaction points:

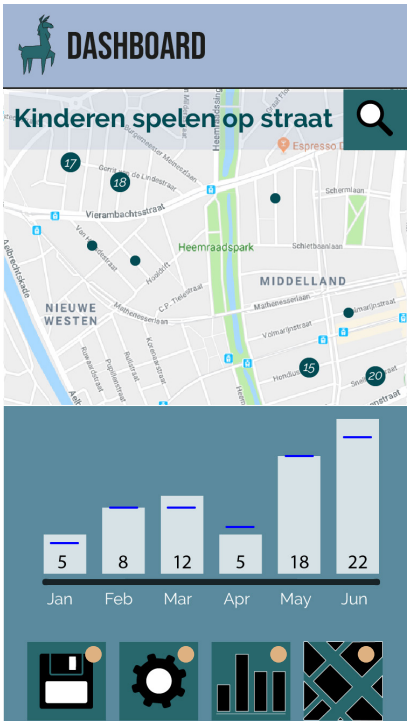
Click to; open a recent dashboard, go back or okay and next

Type the label of the data you are looking for to oversee its dashboard

Screen 6.1.1
Interaction points:

Click to; select weeks or months, set a preferred range of weeks or months, add YTD, add MAT, add compared to prior years, go back or okay and next.

Similair principles for screen: 6.1.2



Screen 6.2.3
Interaction points:

Click to; find other data (dashboards), save the dashboard, change the settings,and chart, map

Similair principles for screen: 6.2.1, 6.2.2

BENEFITS FOR STAKEHOLDERS

The application L.A.M.A. will deliver benefits to a variety of stakeholders in a direct and indirect way. Stakeholders who will benefit from L.A.M.A are; the area networkers, the data analysts of the municipality, the municipality in general, active citizens and, citizens in general. The area networker and data analyst will directly benefit from L.A.M.A, where other stakeholders will do in an indirect way.

The area networkers can use L.A.M.A in their advantage to use it for collecting knowledge of the neighbourhood in an easy and swift way to support for their knowledge and cast a critical view on the phenomena. The gain for data analysts is the opportunity to get detailed knowledge and become more critical in their analyses by adjusting and optimising their findings in big databases. The area networker and data analyst directly profit from their dialogues as it creates a strong collaboration, allows to adjust optimisations and share data knowledge.

The active citizens benefit from the support of observation data in which the area networker can demonstrate and strengthen the argument for their initiatives. By sharing this knowledge, initiatives can be developed quicker into solid proposals with increased potential for acceptance by the municipality. The municipality in overall profits from strengthening of the network within their organisation and by closing the gap with them and the citizens by gaining a grip on knowledge of the neighbourhoods. As the municipality obtains a better understanding of topics of interest in the neighbourhoods, they would respond quicker provide better service to their citizen's needs. Both active and other citizens benefit in an indirect form. Since the citizens will experience improvement of their neighbourhood, which will result in increasing the trust of the municipality and taking care of their neighbourhood in the citizens' interest. An overview of the stakeholders, benefits and, way (direct/indirect) of benefit influences is created in figure 45.

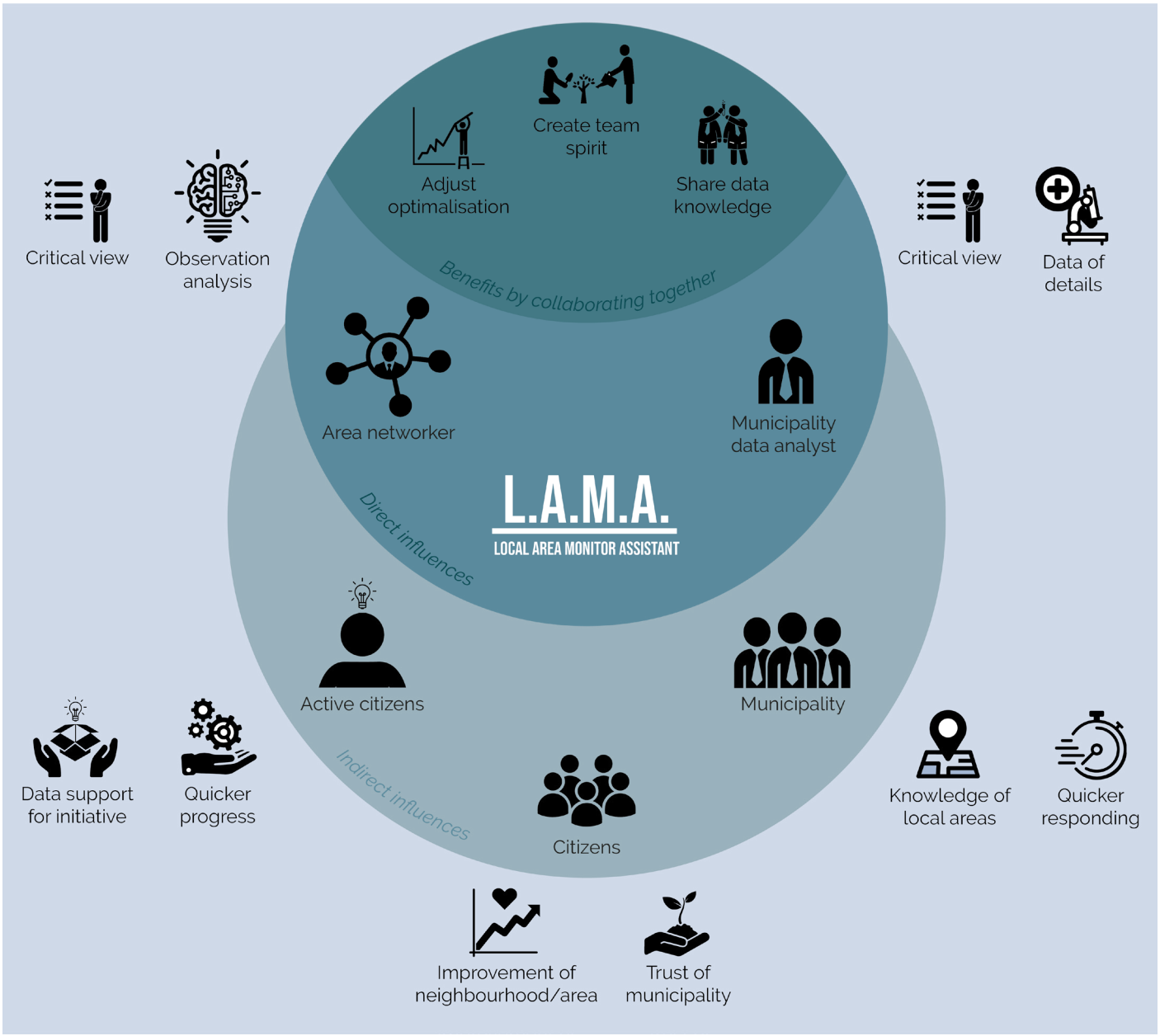
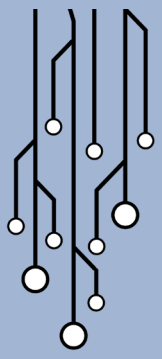
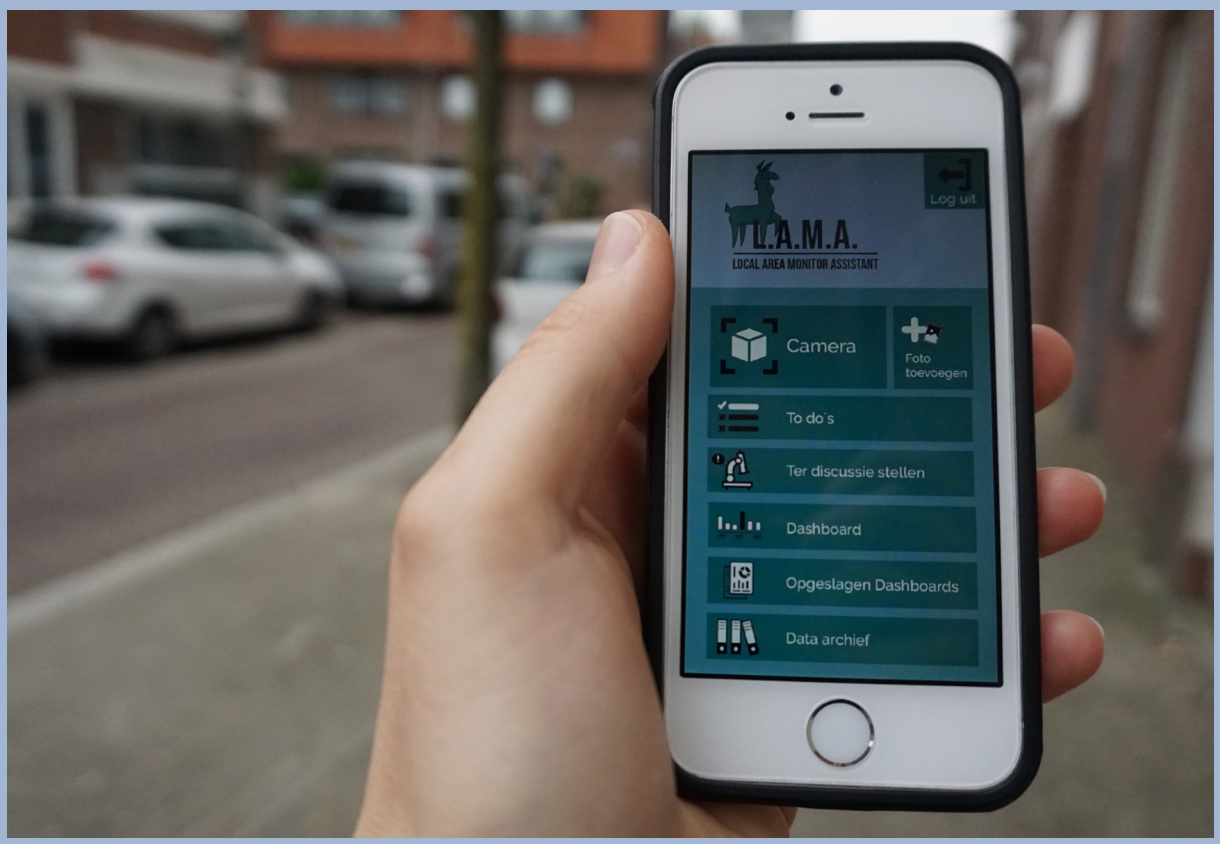

Create team spirit
Adjust optimalisation
Share data knowledge
Critical view
Observation analysis
Critical view
Data of details
Benefits by collaborating together
Area networker
Municipality data analyst
L.A.M.A.
LOCAL AREA MONITOR ASSISTANT
Direct influences
Active citizens
Municipality
Data support for initiative
Quicker progress
Indirect influences
Citizens
Knowledge of local areas
Quicker responding
Improvement of neighbourhood/area
Trust of municipality

Figure 45



Realise the design by evolution & future vision

REALISE



INTRODUCTION

The chapter 'Realise' answers the question of how to implement the proposed concept L.A.M.A. that has been made in the chapter 'Create' and how to continue with L.A.M.A. in the future. It is essential to develop L.A.M.A continuously and to keep it up to date with the needs of the users. In addition, it is recommended to add new technologies, keep them up to date and evaluate L.A.M.A a few months after launching to take in needs, problems and wishes for future improvement and development. An evaluation has been conducted with a user test using a digital prototype of the L.A.M.A. application. The evaluation study verifies the design goal, whereby the result will lead to recommendations for further development that must be taken into account. With a few insights found during the evaluation study, the design of the application is optimised to make a good fundamental base of L.A.M.A. to continue with for further progress of realising the application. For the future development, a vision for 2036 is formulated and visualised in a roadmap, which illustrates the future development of L.A.M.A. over time in layers which represent the market, business, product, technology, and resources.

REALISE

EVALUATION

The concept proposal, L.A.M.A., is evaluated by conducting an evaluation study to come to recommendations to take into account for future procedure. The objective of the evaluation study is to get feedback on the application. The study evaluates if the set goal, see below, has been achieved. Furthermore, the study is conducted to find recommendations for further development of the application.

"Make data as tangible as 'Wikipedia' with the possibility for the area networker to find and add information to provide more comfort and control of data usage to thereby optimize the connection, understanding and easier delivering of support for their neighbourhood."

Research questions are formulated for the evaluation study:

•Does L.A.M.A give the user a feeling of comfort and control over what is happening in the neighbourhood?

•Does L.A.M.A. provide data in an understandable way for the user?

•Does L.A.M.A. make collecting and overviewing the data in an efficient way, and is it easy to access?

METHOD

Prototype

For testing the application, a digital interactive prototype is made in Xd (design experience software by Adobe). The prototype can operate on a smartphone (see figure 46). Two scenarios are used as examples of what the user could capture as observation data. A pilot was done to test if the prototype was working properly.

Participants

The participants for the evaluation study consist of citizens and area networkers (n=8, area networkers/citizens=4/4, female/male=4/4).

During the test, the area networkers are asked if the application can be of support for their daily responsibilities. The citizens will be asked how they feel about it if the area networker applied

L.A.M.A within their neighbourhood and if they are interested in apply L.A.M.A. themselves. As one of the objectives is to make citizens more involved in the future (see chapter Analyse), citizens get the same questionnaire as the area networkers. In this way, a perspective of how citizens experience the application can be taken into account for the future development. This is done, so the application does not need to be adjusted or more in-depth researched.

Procedure

Before the test starts, a short introduction was given to explain what the application is about briefly and the goal of the research. During the test, the participant is asked to perform some tasks with the application and thereby think aloud. The participant was observed during the task. When the tasks where finished, the participant was asked a few questions about the experience of the application. After, a questionnaire about the usability, experience, and opinion of L.A.M.A. being applied was given (see Appendix D1: questionnaire concept evaluation). After the test, the participant got a small reward to thank them for participating.

Analyses

The tests are voice recorded, and only the usage of the prototype was filmed, whereby only the hands of the participants were visible to secure the privacy of the participant (see figure 47). During the tasks and briefly evaluation conversation, observation, and notes where taken. Afterward, most frustrating, difficulties and, suggestions were identified for further recommendations. The questionnaire was analysed by taken out most remarkable answers, and the review form was counted to get an indication of how the participants experience the application.

The results are divided into usability experience and functions experiences. Within both parts, all remarks and insights of the participants are taken into account. As the main insights from all participants will be used, but since the area networkers are the first target audience, where the application will be used by, their opinion will be of higher need to be taken into account for further optimization. The results will be translated into recommendations whereby some will be taken in as direct recommendations and other for future development recommendations.

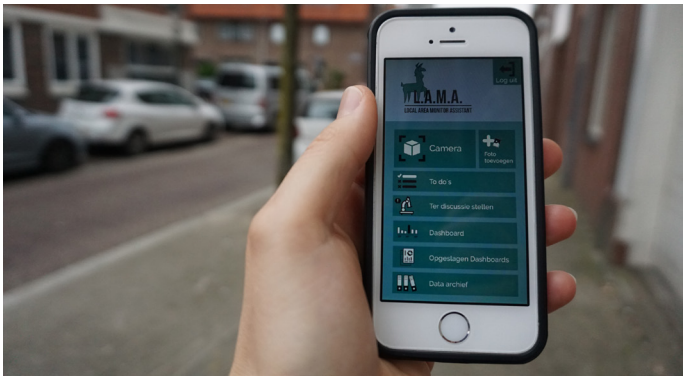


Figure 46

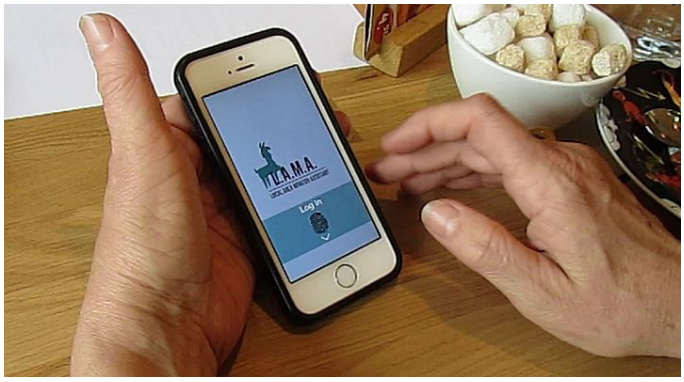


Figure 47

RESULTS

All participants of the evaluation study were positive about the idea of the application. In general, the participants experienced L.A.M.A. as clear, understandable, quick, easy to use, efficient, supportive, applicable, motivative and, agree that the application gives a feeling of involvement with the neighbourhood.

"An efficient way to collect and overview my observations"

As the area networkers really liked that the application contributes on multiple aspects (network between them and policy, support for their observation memory, quick and easy to apply and gives an understandable and good overview of observations). In addition, L.A.M.A. gives the ability to open up and explore new opportunities which can be interesting for multiple stakeholders.

However, the feeling of control was not really reflected by the application during the evaluation study. Still, the area networkers found that the neighbourhood was too big to overview it all. Therefore all participants saw the application working at the best performance providing the feeling of control when multiple users could collect data and allowing them to have access to see all data collected by all users. Thereby the feeling of control could be accomplished when more data is being collected and shared.

Further results of the evaluation study are divided in the usability and functions experience to gain a clear overview of the outcome of the test results.

Usability experience

Clearly, the users needed to get used to the way the application works. As the way to go through the options is quite thorough since the user needs to click on the chosen option and then click on the check mark to be able to continue. This way of working seems a bit old, but during the discussion, the users told that they preferred this way of going through the options because now you know for sure you made the right choice (see figure 48).

One issue that was remarkable for all participants was the home button when using the dashboard. All participants had difficulties to find out that the logo was the link to go back to the homepage. All participants tried to click on all logical options but had undoubtedly problems to find out the logo as the button for the home screen (see figure 49). Some even needed a tip.

The application, in general, is clear and easy to be used for the participants, and some who needed some more time made clear that they will quickly get used to it when using the application more often.

Functions experience

According to some participants, L.A.M.A. provides a strong opportunity to stimulate a bottom-up approach. This helps to optimize the neighbourhoods as the application enhance being the ears and eyes of the neighbourhood and therefore a better perspective of the phenomena can be displayed.

The area networkers had some interesting key marks to apply for the application. One area networker, who had more experience with data,

was missing an integration option to couple databases together.

"In this way, you can integrate different information, which will result in an integrated approach."

Next to more data related addition, all area networkers found it interesting to enhance the interaction between the neighbourhood and policy by applying the application. In addition, a stronger network can be realized between the policy and area networkers.

"Whereby the data I collected can be sent to the right person within a specific cluster, so they can pick it up directly."

Besides, many participants were suggesting to add a notification overview to know what is picked-up and what is handled. Furthermore, a few participants tried to combine label suggestions to create their preferred label. This function will be added to the application since it enhances the user-friendliness of the application.

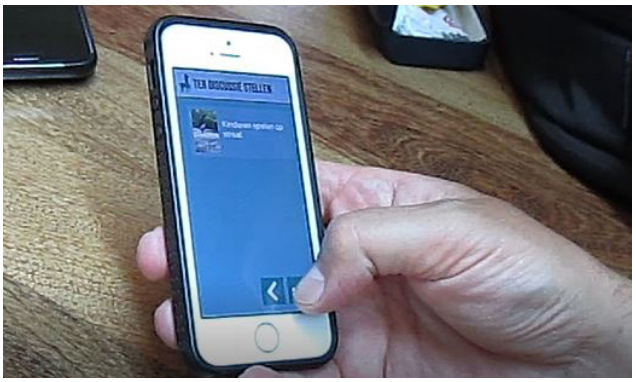


Figure 48

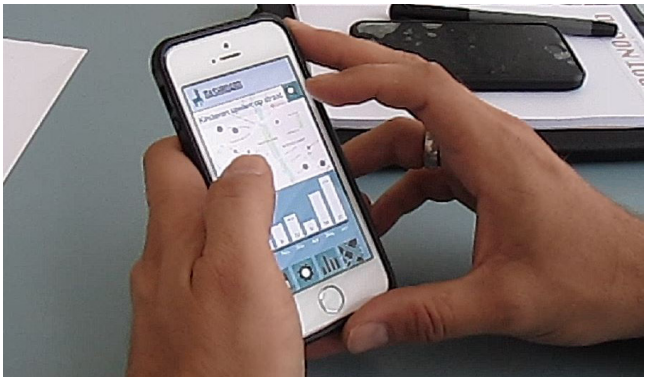


Figure 49

RECOMMENDATIONS

The outcome of the evaluation study has led to recommendations to improve the application. The main recommendations will be discussed for further improvement and development of the bases of L.A.M.A. and future development.

Recommendations for the construction of the base of L.A.M.A.

The application is seen as an opportunity to strengthen the network between the policy and area. In this way, a more bottom-up approach can be realised. The area networkers came with a suggestion to add policy themes when informing someone using the direct pick-up indication. In this way, the user can send a notification to the right person who is responsible for that matter. By doing this, a quicker response can be created to optimize the phenomena by the policy. To realise this, extra research is needed to make the application connect with the right policy clusters and implement the notifications among their daily work process to realise the collaboration. In addition, the topic of control must be programmed in a way that a balance is being provided to make use of the application by the area networker or push top-down to let the area networker collected data in a structured and long-term approach in order of the person within the policy clusters.

Further development must be done for the interaction experience of the application. An extra button could be added or next to the logo, a clear icon of the homepage must be added to make going back to the homepage easier to find. Furthermore, a test can be done by using a fixed menu and a sliding menu to make the application easy and quick to apply.

A clear overview of the procedure of the to-do's and 'pick-up for discussion' can be added and further researched. Tests can be conducted to study what the user needs to know about the procedure and in which way to make this visible for them. For instance, the procedure can be shown in detail or rather abstract by just showing that it is picked up and being handled.

Recommendations for the future development of L.A.M.A.

Since data will be more applied in the future, a possible data integration addition can be interesting. This option needs to be further tested, how the user can integrate different datasets and how to analyse the outcome to avoid biased causations and maintain a critical view.

Campaigns need to be made to let citizens know that they can start using L.A.M.A. along with the benefits. In addition, a list of most frequently answered questions about privacy and security needs to be made. Instructions and support need to be available how to make use of the application, as the citizens need to know what the policy clusters stand for and which one to pick when sending a notification.

In addition, more in-depth research needs to be done to see if it is necessary to make some options only available for area networkers, to maintain their function above the citizens' input. When logging in, the user can be recognised, which makes it possible to separate the area networkers from the citizens.

CONCLUSION

L.A.M.A. provide the participants with a feeling of comfort using data, but it still needs some more development to give a feeling of control. The participants mentioned that this feeling might be achieved when the data is shared among different users.

L.A.M.A. achieved to make data understandable, easy to collect and to give an overview to the potential user, area networker and citizens. The area networkers who tested the application and gave their feedback were all convinced that the application has a lot of opportunities to provide support to both the municipality and the citizens. The area networkers recognized that the application has a lot of potential to provide a bottom-up approach and network support. Furthermore, the citizens who had tested the application and provided feedback were all enthusiastic about the functionalities of the application, especially on the direct pick-up function. The evaluation study has resulted in new insights for further improvement and development of the application.

DISCUSSION

The test is conducted with a small sample of participants (n=8). A larger sample would be needed to make the recommendations more validated. In addition, the digital prototype had limitations and would need to be further developed to test the application by the area networkers for a more extended period. Furthermore, the researcher herself has conducted the test, which could have affected the behaviour of the participants. The participants could be directed to give the answers the researcher wanted to get.

REALISE

DESIGN OPTIMISATION

The evaluation study has provided new insights regarding the design and functional experiences of the application. Within this part, some screens are redesigned or added. It is essential to reduce the number of decision-making options, to make the application easy and user-friendly. This is applied in the redesign of the application. As some functions are taken out, and others were made more apparent to the user.

Dashboard extra buttons are gone

During the evaluation study, no remarks were given, neither a specific barrier perceived using the options below when setting the right settings for the dashboard (see figure 50.1 of the old situation). But since these functions are unnecessary and their presence is of no added value, the option has been taken out to make the steps to continue or go back more straightforward (see figure 50.2 for the redesign).

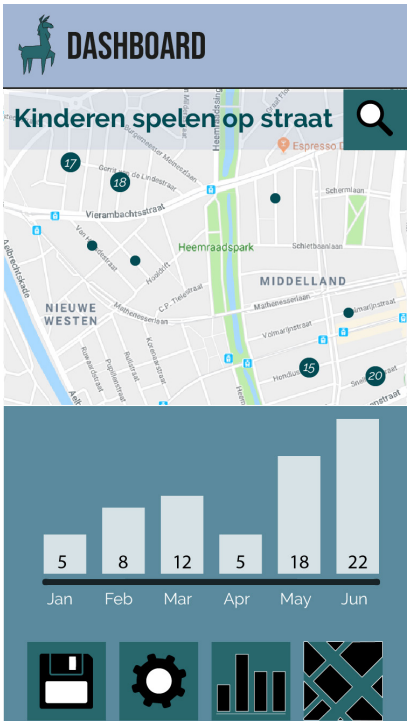


Figure 50.1: Old

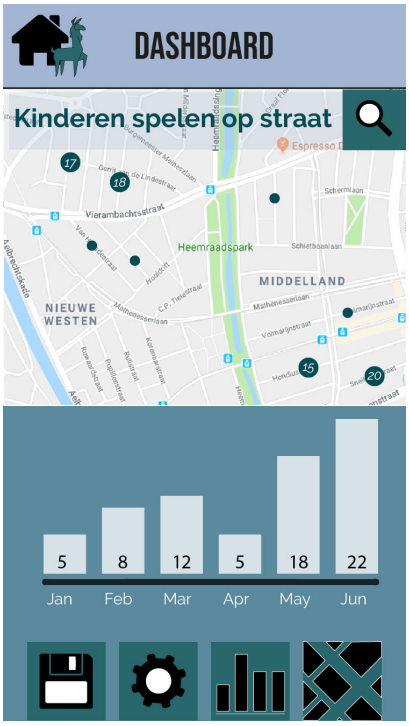


Figure 50.2: New

Better homepage button

Going back to the homepage is still functioning with the logo, but a home icon was added to make the communication more apparent to the user (see figure 51.1 for the old situation, and 51.2 for the redesign) (this will be adjusted for all screens except for the login, registration and home screen).

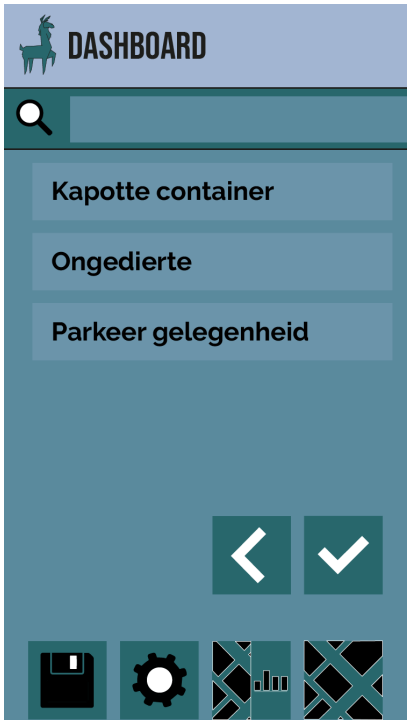


Figure 51.1; Old

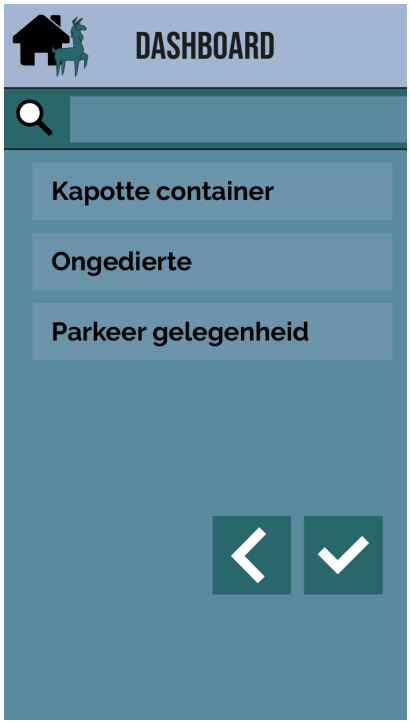


Figure 51.2: New

Mix to create labels

Some participants tried to click on two suggested labels to create a new label, as this probably makes the labelling easier or quicker, this option has been added (see figure 52.1 for the old situation and figure 52.2). The user is now able to mix the suggestions when adding a label, type one manually or chose a suggestion.

Figure 52.1: Old

Figure 52.2: New

Clusters

Another interesting insight for the design optimisation is the addition of the clusters of the municipality of Rotterdam. There are eight clusters; Social Development (Maatschappelijke ontwikkeling), Urban Development (Stadsontwikkeling), City management (Stadsbeheer), Work and Income(Werken en Inkomen), Services (Dienstverlening) and, Management- and Concern support (Bestuurs- en Concernondersteuning)(Gemeente Rotterdam, 2017, January).

The clusters are implemented in the process of collecting the observation data. The user can, after labelling the data, assign clusters fitting the reason of observation (see figure 53.1). As in the future other users, besides the area networkers, will make use of L.A.M.A., information buttons are added on every cluster (see figure 53.2) to show what the clusters consist of and show a few typical examples. This will provide support to make the right selection of one cluster (or more fitted clusters) for the user.

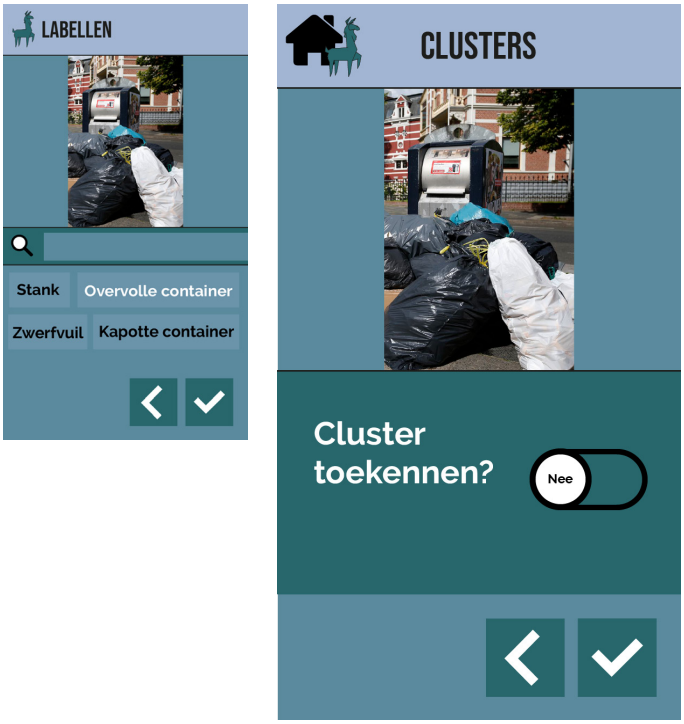


Figure 53.1

Figure 53.2

Status update

An indication is shown next to the to-do's, on the to-do list to provide the user with an indication of the status of the to-do (see figure 54.1 for the old situation and 54.2 for the new situation). The process of the to-do's consist of four phases illustrated with four status indicators (see figure 54.3).

Figure 54.1: Old

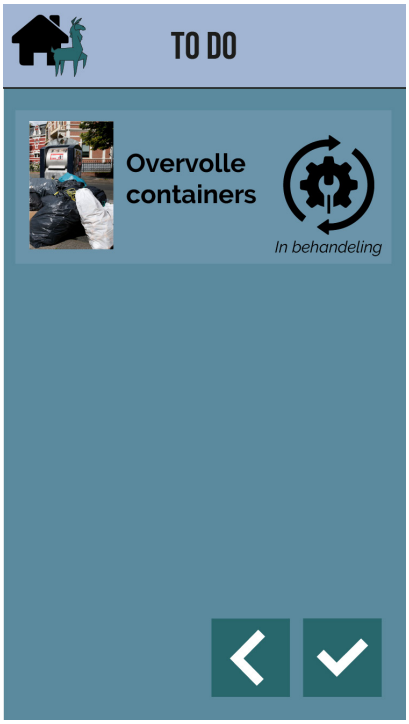


Figure 54.2: New

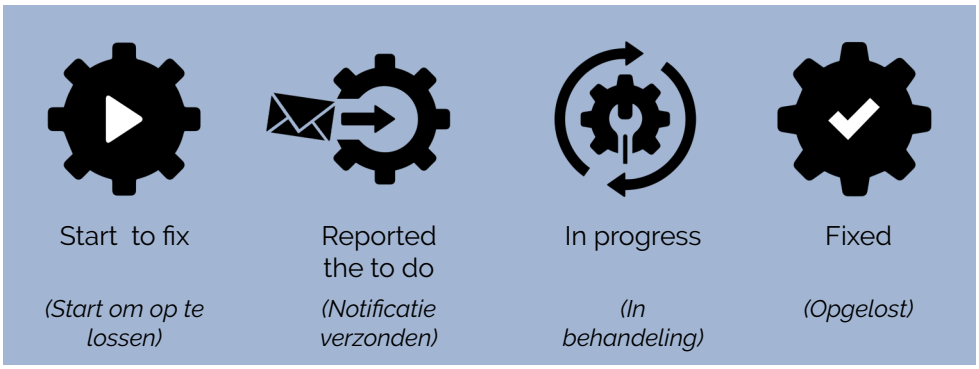


Figure 54.3

REALISE

ROADMAP

By evaluating L.A.M.A. new insights are being found and taken in for future development of the application. This development is presented textually and visually in a roadmap. The roadmap illustrates the plan how to develop L.A.M.A including the incorporation of recommendations from the evaluation in phases to achieve the final vision in the year 2036. The final result of this project will be the kick-off point for the roadmap which consists of three phases. The first phase will take till 2020 and will focus on a solid foundation and development of L.A.M.A. and establish the usage of the application to become a daily routine for the area networkers. In the second phase, L.A.M.A. spurs to strengthen the connection between the citizens and municipality up to 2024. In the third and final phase, L.A.M.A. becomes a virtual assistant to connect and support the active citizen, area networker and data analyst in 2036. The first two phases with the vision set for 2020 and 2024 will be considered as milestones, and the last phase is considered the final vision set for 2036 (see figure 55).

FIRST PHASE

‘Create the foundation, 2018 -2020’

This phase focusses on the development of the L.A.M.A. application, optimize and make L.A.M.A ready for the launch by performing pilots and creating a network between the area networker and data analyst.

The use of data is a new way of working for the area networkers and needs to be implemented thoroughly to be accepted and embraced.
The objective of this phase is to make the area networker become familiar with the use of data and learn to apply it in his/her day-to-day work.

L.A.M.A. needs to be a working application, which is safe and secured to use. When the application is working, a few pilots will be done to find points of improvement, analyse the usage and added value which results in optimizations. During the pilots, the development and testing are both parallel processes. Errors and problems encountered in use will be adapted to improve and optimize the application. Once the pilots have been tested successfully, the application can be launched and used by all area networkers of the municipality of Rotterdam.

The network and dialogue with the data analysist of the municipality of Rotterdam also need to be tested and evaluated to strengthen their collaboration and make the dialogue support for the area networker happen. Especially the development of dashboards is essential to make the data tangible for the area networker to gain insights and create support for the dialogue. In addition, the possibility to add the policy clusters for contacting the right person must be explored.

SECOND PHASE

‘Strengthen the connection between the citizens and municipality 2020 – 2024’

In this phase, new features will be developed. At first, other area networkers within Rotterdam can share their knowledge and insights. Second, access will be provided for active citizens to start using L.A.M.A. for their neighbourhood. As a result of these features, further develop and stimulation will be made to strengthen the network between the area networker, the active citizen, and the data analyst. Besides the accessibility of the application and the development of the network, a next step can be made to implement the option to integrate databases.

When L.A.M.A is launched and applied, the application will be evaluated and can then be further developed. The first feature that will be added is to allow the area networkers to swiftly share their knowledge among other area networkers within Rotterdam with the objective to learn from each other and optimize their network. In this way, area networkers create a stronger network between themselves and the different neighbourhoods.

Another feature is added to give the active citizens the ability to participate, using L.A.M.A., support, and advice their neighbourhood and area networker. In this way, their involvement will make the connection between the area networker and data analyst become stronger and will result in gaining more understanding, trust, and transparency within the municipality. The area networker can show active citizens how the insights can be used as support for their initiatives. In this way, the area networkers promote L.A.M.A. and show the active citizens the possibilities and added value of the available data. A campaign can also be organised to encourage the usage of L.A.M.A. and reach a broader diversity of potential users.

When opening up the application for the citizens, research is required to explore the necessity to make some functions or options only accessible by the area networkers. By doing this, the area networkers maintain a feeling of control to gain the right benefits and support from the application.

Next to the above features, a test can be conducted to explore new options to integrate different databases among each other and bring the use of data to a next level. L.A.M.A. could already support this integrated function by advising when data seems to have similar patterns or correlations. This development supports the user in gaining more and better insights from the available data. By applying this feature the user and application are prepared for the next step to make L.A.M.A. act as a real virtual assistant.

THIRD PHASE

'Develop and launch of virtual assistant L.A.M.A. 2024 – 2036'

In the last phase, the final future vision of 2036, L.A.M.A will be transformed into a real virtual assistant. To accomplish this, usability pilots and optimizations are deemed necessary before launching the new feature. The assistant that will be created will simulate and translate patterns and correlations from the data into solid cases as a start for an initiative and strengthen the direct collaboration between the active citizens and municipality. The assistance of L.A.M.A in this phase will not be entirely new. As already mentioned in the current concept proposal: L.A.M.A., the application gives supporting suggestions of similar photos, supports to quickly schedule meetings with the data analyst, and inform departments or organisations by using the to-do function.

The new feature to develop a virtual assistant makes L.A.M.A. enter a new dimension. The development of the assistant will be done by applying machine learning technologies like NLP and AI. The development and testing of the assistant will take time before it is ready to be implemented. Therefore this phase has a

bigger timespan. Besides, some features in the application are required to be adjusted to fit with the assistance. Furthermore, IoT (Internet of Things) will become more involved in the development of the virtual assistant. For example with domestic waste, storage containers will be able to send information about how many hours or days the container is full and not yet has been emptied.

When the application is working, and has passed the pilots, the new version will be launched named L.A.M.A. 2.0. The assistant will provide support to create business cases for initiatives to be worked out. The assistant will also support the active citizen and the area networker to start a meaningful dialogue, to convince the municipality to collaborate and co-create the initiatives together. Furthermore, the assistant provides the users to connect with the right support to make a start to realise the initiatives become more tangible to realise. In this way of working a direct dialogue and collaboration between the citizens and the municipality can be accomplished.

FIRST PHASE

'Create the foundation, 2018 -2020'

SECOND PHASE

'Strengthen the connection between the citizens and municipality 2020 – 2024'

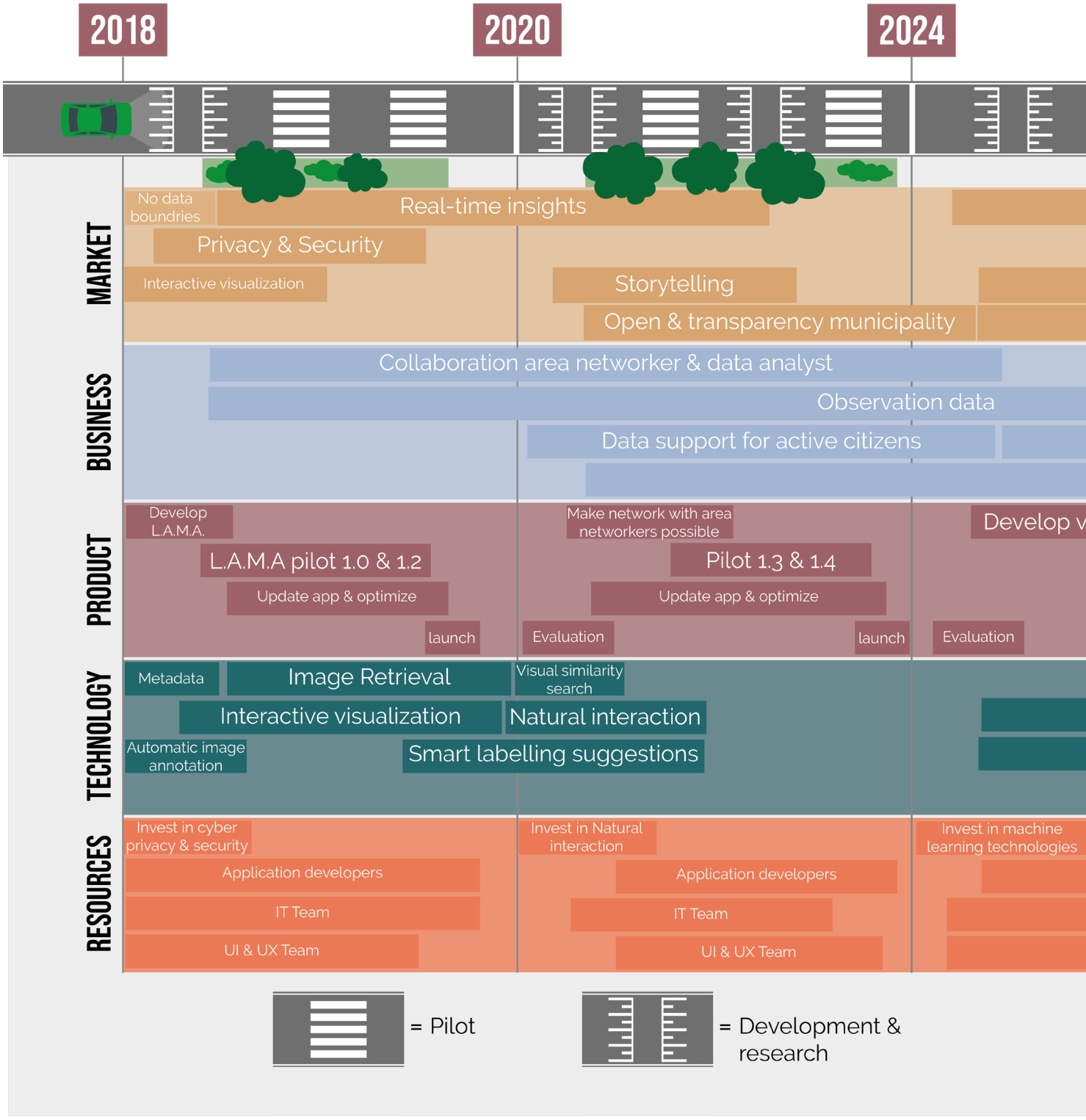
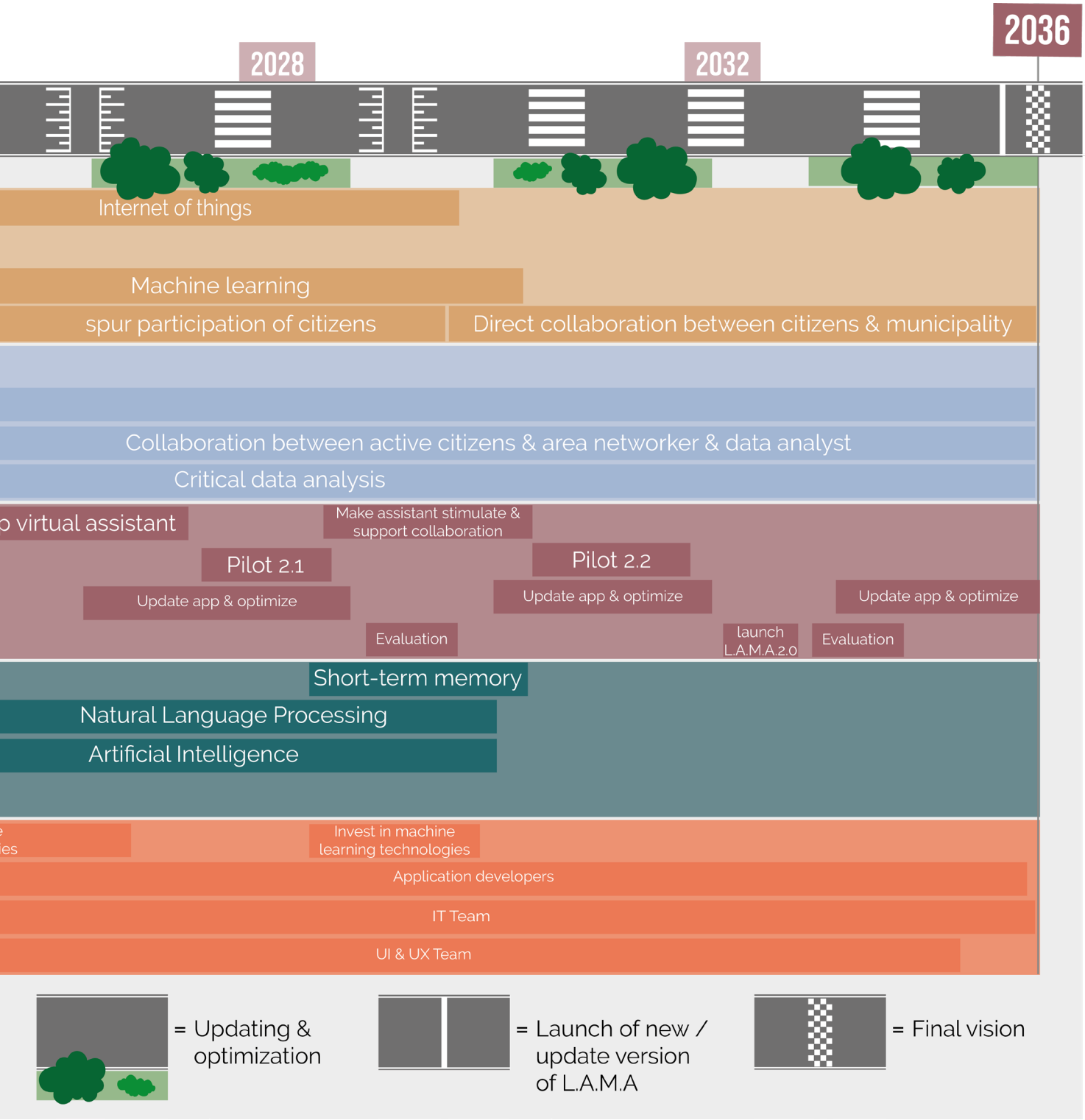


Figure 55

THIRD PHASE

'Develop and launch of virtual assistant L.A.M.A. 2024 – 2036'



CONCLUSION

INTRODUCTION

The final chapter consists of a conclusion, discussion, and personal reflection. The conclusion is made of the overall process of the project and the application that is created and evaluated. The discussion is written as the project has its limitations and gives advice on how to improve and continue with particular parts of the project. The chapter finishes with a personal reflection, where an evaluation is written about the personal goals and pitfalls during the project.

OVERALL CONCLUSION

The main research question for the project was 'How can active citizens be supported by data to begin collaborating and share their initiatives with the municipality?' During the research phase (chapter Discover p.18) and the phase where all insights found are filtered and translated to the chapter Analyse (p.54), the problem turned out to be quite broad to solve with one step to approach. Therefore, the problem was divided into three steps to approach the problem, with a focus of this project to work out the first step. The first step is to let the area networkers become familiar with using data and applying data to their daily responsibilities. Therefore, a value proposition statement was formulated:

"Make data as tangible as 'Wikipedia' with the possibility for the area networker to find and add information to provide more comfort and control of data usage to optimize thereby the connection, understanding and easier delivering of support for their neighbourhood."

The value proposition statement is translated into an application designed in the chapter Create (p. 68). The application named L.A.M.A. (local area management assistant) provides support to gain knowledge of the observations of neighbourhood for the area networker. Increasing knowledge results in a better understanding of the neighbourhood and makes supporting to connect with citizens better and optimization of the neighbourhood in a controlled and comfortable way by using the data.

L.A.M.A. makes collecting data approachable for anyone by making a photo to capture data. Since an image sees more than a thousand words, misunderstandings can be avoided and by labelling and add notes, understand becomes very visible for anyone to understand. Besides, the easiness to collect the data, the user will learn to see the benefits of collecting to provide knowledge out of the dashboards to stimulate to make the next step.

The application also has potential to be used as a data tool for the hackathons Open4citizens organises, since the application has a bottom-up approach to the contribution of the development of Rotterdam. Next to the area networkers who will feel much more comfortable working with data, also the citizens will start feeling more confident to participate in the hackathons. In the future citizens could begin collecting data and share their insights during a hackathon to make their story strong and give the citizens confidence that their contribution and initiates' could make a difference for their neighbourhood.

The application is further evaluated in chapter Realise (p.94). In addition, a future vision for 2036 is formulated together with a roadmap and steps to develop the application, taken in all steps to provide thereby a development plan to achieve the formulated problem statement.

As the project started with translating and taken data from the streets, in the end, L.A.M.A. makes a cycle complete within this process as initiatives and optimization will follow because of L.A.M.A. Therefore, new data will pop out in the streets given the opportunity again to explore further, better and different than before.

CONCLUSION

DISCUSSION

The process of forming L.A.M.A. was a challenge. Although the application still needs to be further developed and tested, the fundamental principle has is created. However since the limited amount of time for this project, a few features are needed to explore which will be discussed within four main features; L.A.M.A. supports the area networker, stimulate a diversity of users, making a solid story for a discussion, elaborate on encouraging initiatives.

L.A.M.A. SUPPORTS THE AREA NETWORKER

Since a small number of area networkers tested L.A.M.A., there is no significant evidence that the application actual provide support for their daily responsibilities. Therefore, the application needs to be tested in a small pilot to get a clear grasp of the experience by applying the application for the area networkers. In addition, the other types of devices need to be designed and tested by the area networkers. Until then, the full experience of L.A.M.A. can be unravelled. Next, to creating and doing research on the whole experience, a clear regulation needs to be written to avoid possible top-town expression and let the area networker lose control. An example can be that an employee of a policy theme starts asking to collect data every day or at specific times. These phenomena will result in loss of control and executive duties for the area networker what will have influences on collaboration, connection, and motivation to continuing using the application.

MAKING A SOLID STORY FOR A DISCUSSION

The part where the user can start to make an appointment with a data analyst is because of the time limitation not work out. This part needs to be further developed and tested to find a supporting way to make a solid story to present during the appointment. Therefore, storytelling and extra visualisation need to be implemented. There should also be an opportunity to meet in groups. Otherwise, the data analyst might end up

with many similar discussions, which costs a lot of valuable time. In this way, the network among the other area networkers and in the future active citizens can be gain a benefit from these group meetings. In addition, the collaboration with the municipality clusters, data analysts, and area networkers need to be further developed and organised.

STIMULATE A DIVERSITY OF USERS

As mentioned in the chapter Discover we all have are our own perspective on a phenomena. Therefore, it is essential that a variety of citizens will use L.A.M.A. in the future. In particular, since everyone experiences a neighbourhood differently because of the influences of the individual mental constructs. To accomplish this, simple functions as changing language must be added to the application to make the threshold as low as possible. This matter needs to be tested, and more research is required to find different ways to provide to stimulate the citizens to apply the application.

ELABORATE ON ENCOURAGING INITIATIVES

As the goal of the project stated to make data provide support for initiatives created by active citizens, this goal was not achieved in the end. The problem seems much larger than expected. The first step has been made, but still elaborating on encouraging the initiatives of the active citizens will need more time. L.A.M.A. can help to provide data insights or can be used to find and collect inspiration and supporting argumentation for initiatives.

Nevertheless, the concept L.A.M.A. can be seen as a first step to come closer to enhance the collaboration between the citizens and municipality envisioned by using data.

CONCLUSION

REFLECTION

Looking back at the process of the project, it was challenging what resulted in a new experience, and I learned a lot. In the beginning, it was difficult to get a grip on the entire phenomena. Since the research question turned out to be broad what made it hard to narrow it down to a concrete problem definition and design goal to achieve. Besides, I loved to involve psychological aspects to the research part, since it has an enormous contribution to the topic of understanding. During the project I had two pitfalls to take into account; 'I want to do it all' and 'I like to figure it all out without asking for help.' To prevent these pitfalls I set-up two goals; 'working fast and efficient' and 'keeping a clear narrative.' When, during the project, I found myself sliding into one of my pitfalls, I reminded myself of my goals and pushed myself back (see figure 56 for an overview of the pitfalls and purposes).

Figure 56

I am critical to myself, which creates a barrier to stick to the planning. Friends and family often confirm that I am working hard when sharing my thoughts and 'to do' list about my project. Many times they advise to start being less critical and told me the results are good and keep on continuing the process.

Before I would come and ask for support, I explored all kind of ways to find a solution by myself, which resulted in a lot of time wasted. Therefore I pushed myself to accept that it is fine, to somethings ask for support from my supervise team, friends and, family.

A remarkable aspect of myself is that I want to know everything in detail since I am a very curious person. That resulted in a large Discover chapter whereby I had made use of books, literature, study cases, interviews and presentations to find answers to all my questions. The research which I had made without any discussion or advice of others, resulted in extensive research which gives a perfect perspective of the context of the topic and provides me to feel convinced how to continue the project. However, I encountered a vast challenge, later on, to make an actual clear story out of the research understandable for the reader. As I have learned a lot about my research itself, I started to apply more visuals and let go of taking in all small details. Since out of my research visualisation is a strong language to communicate, I began to make a visual of all topics I researched. By doing this, I experienced a lot of support by making something visible as support being able to translate all research into a solid and clear story.

As my goal was set to work fast and efficient, I learned that this is not always the case and learn to accept that some aspects need more time to result in a good output. Therefore let thoughts settle for a while and meanwhile continue with other parts and pick it up, later on, has more efficient in a continues result. In short, I enjoyed working on this project, and I take all new learnings and goals along for the future.

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APPENDIX

APPENDIX

A: DISCOVER

A 1: DATA HISTORY

In the old form, data was translated for example into Mayan calendars or Oracles. As the human generation involved itself, we started collecting information and structure it with the aim to make it visible, to reuse and store it as we are still doing today. Started by simple information visualised in clay discs in 2000 B.C. with inscriptions on the disc what holds a transmitted information form of that period (Cukier, 2014).

Data has always been used to give support in decision-making processes. Since the 18th century modern statistics, the science of the systematic treatment of demographic and economic data, was started to be developed (Rendgen, Wiedemann, Ciuccarelli, Wurman, Rogers, & Holmes, 2012). During the rise of the computer, data has become easier to access, stored and analysed and made it more accessible for anyone to work with. At the moment, data has made uplift in volume, velocity, and variety which made captured data become big data and has become an indispensable aspect for organisations (Mindruta, 2014).

A2: OPEN DATA

Gesprek met de stad

'Gesprek met de stad' is a project organised by the municipality to gather the insights of their citizens with regards to their view on the future of the city. By collecting data and interviews amongst 9.000 citizens of Rotterdam a database and website is being created to share their thoughts about the future of their city (Gemeente Rotterdam., 2017a). The output of the initiative of the municipality is open for the public and they can analysed by anyone.

Gezondheidsatlas

The 'Gezondheidsatlas' is based on the data of the GGD and is open for the public via the Internet. The database gives insights in data related to the health and well-being of the citizens living in a certain region, district or neighbourhood. The data can be displayed in a table, map or graph and be compared to other regions, districts or neighbourhoods. The database is updated a couple of times a year.

Centraal Bureau voor Statistiek

The Central Bureau voor Statistiek (CBS) is a Dutch governmental organisation that makes it possible to have social debates and public reports based on reliable and related statistical information. The data analysed by CBS has a wide range and relates to topics that affect people living in the Netherlands such as economic growth, consumption, criminality or free time spent(CBS., 2017). The CBS has reports and databases open for the public use (CBS., 2016).

Stadsarchief

The Stadsarchief is the public archive of Rotterdam and is one of the oldest and biggest of the Netherlands. The archive contains numerous papers, photos, maps, prints and other items that are related to the city of their citizens. The Stadsarchief of Rotterdam is open for the public via the internet. The archive is mainly used to figure out family trees or architectural matters.

Rotterdam open data

The platform Rotterdam open data is an initiative made by the municipality of Rotterdam in collaboration with the Hogeschool Rotterdam (College of Rotterdam) as being part of the development of a smart city. The platform is created to build on trust, better and easier make use of data and transparency towards the Rotterdam citizens. Different insights like traffic jam, incidents or weather forecast can found on the platform which creates thereby a platform of multiple databases on various topics.

A3: VISUALISATION HISTORY

Different forms of charts and infographics have arose in the history of human existence. Around the 18th century the use of data support increased among statistics and to make the data easier to understand, Visualisation development could not stay behind. William Playfair made the first real modern charts in 1786 which we know as the bar, line and pie charts.

In 1869 the French Engineer developed one of the most famous infographics. He designed a flow map of Napoleon's catastrophic Russian campaign, which included links of many variables what made this graphic so outstanding (see figure 57).

The time of the widespread of magazines and newspapers, delivered more attention on data visualisation because some articles used charts or infographics to enhance their story. The images were presented to the public to see and analysed. The larger amount of attention gave the market of graphic design a boost to become more professional and develop new techniques.

In the 1920's-1940's, a scientist named Otto Neurath and artist Gerd Arntz created a way to show data pictorially to workers and employees. The posters that were designed showed standardized pictographic to be understood 'by anyone, anywhere in de world' (Rendgen, 2012).

A well-known and still used diagram which was created by Harry Beck is the London Underground map (Rendgen, 2012)(see figure 58). This map is designed to give the public guidance systems and aids to orientate for public spaces. The map which Harry Beck made is well known since many of the world's public transport maps are still based on his design.

The use of computers made a huge change in the world of creating data visuals. Nowadays anyone can create visual graphics easily via multiple possible software (Rendgen, 2012).

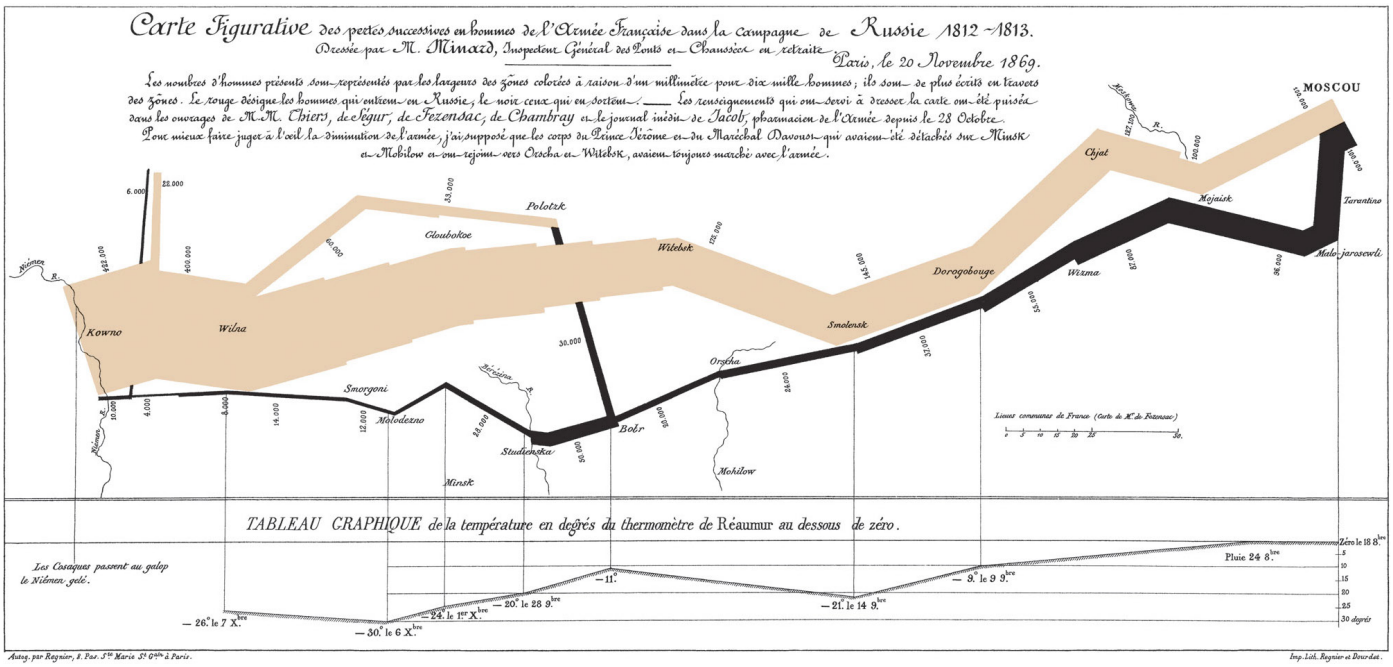

Figure 57

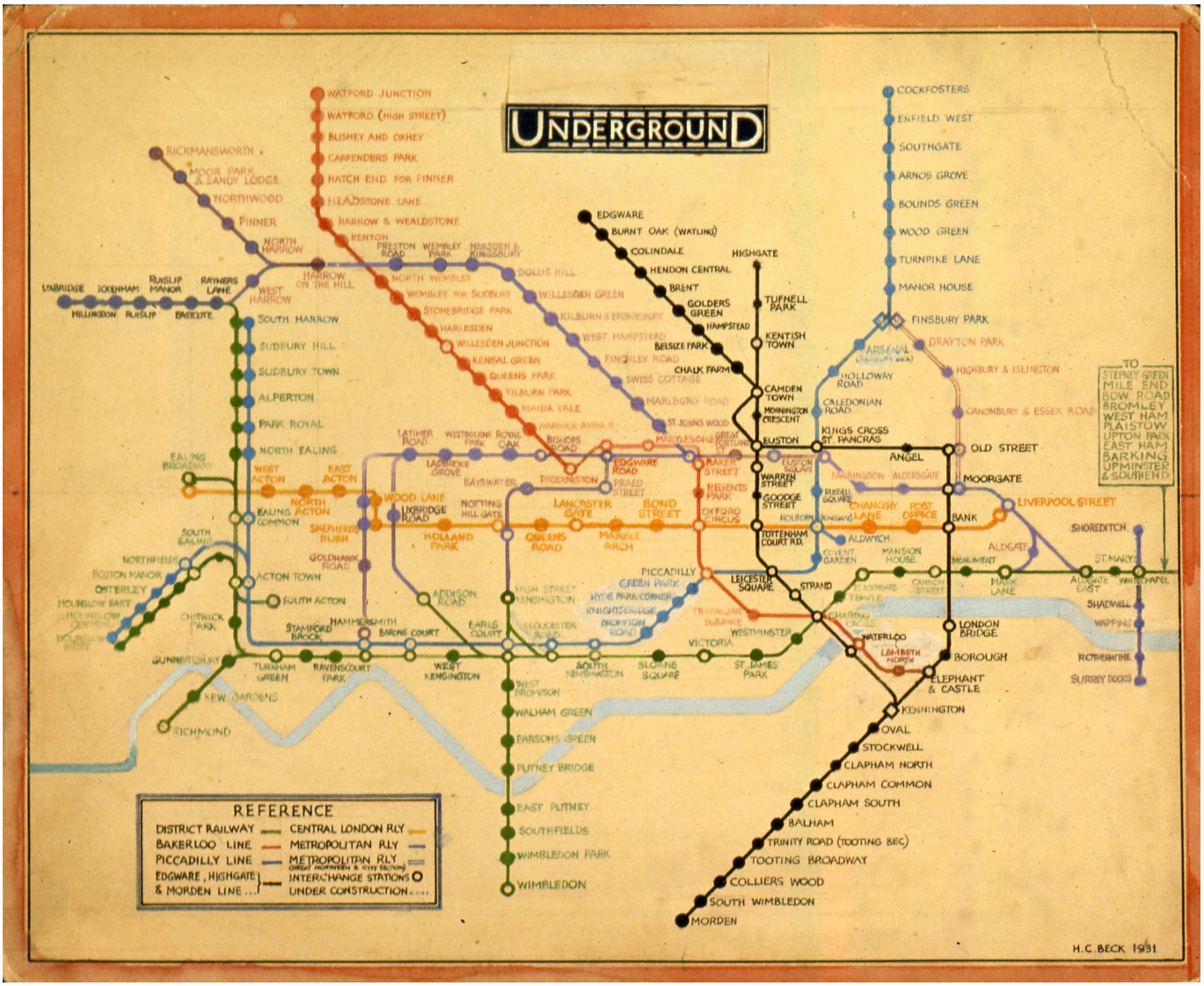
UNDERGROUND
REFERENCE
DISTRICT RAILWAY
BAKERLOO LINE
PICCADILLY LINE
EDGWARE, HIGHGATE & MORDEN LINE
CENTRAL LONDON RLY
METROPOLITAN RLY
METROPOLITAN RLY
INTERCHANGE STATIONS
UNDER CONSTRUCTION
H.C. BECK 1931

Figure 58

A4: HOW TO MAKE THE VISUAL ATTRACTIVE

Applying the AIDA-method (Attention, Interest, Desire, and Action) to a Visualisation is one of the oldest and simplest models but has proven to be powerful and effective (Rawal, 2013). Catching the attention of the viewer is the first step to accomplish. As the attention is triggered, the interest is most stimulated by showing the benefits or shared interest. The Desire is a translation of the interest to a more appealing and desired feeling to convince the potential viewer. The last step is Action which makes the viewer act upon the visual. The action can stimulate to make a certain decision or create a new vision to act on.

A5: INTERVIEW WITH THE PROJECT MANAGER FOR DIGITAL INNOVATION OF THE MUNICIPALITY OF ROTTERDAM

The semi-structured interview with the employee of the municipality of Rotterdam, Frank, is conducted via a phone call and is summarized and translated into English.

A short introduction about the employee of the municipality of Rotterdam

Frank is working for the municipality of Rotterdam as the project manager for Digital innovation and thereby involved in the development and realisation of Smart City Rotterdam.

The interview

Open data has been introduced to get closer to the citizen and to strengthen the existing network. What role does open data currently play regarding the collaboration between the citizens and the municipality of Rotterdam?

A few years ago it was very popular to open your data as a government because that was good for transparency and trust. It was assumed that citizens, companies or institutions would use these databases. That is not a one on one assumption of course. At that time, many municipalities created static datasets open for public use. These databases were updated once a year. These data is very static, examples of the available databases then are; 'where are all trees' or 'trash cans' or 'public toilets.' But, it turned out that there is much more need for dynamic data. With these data, you can create interesting applications or algorithms which you actually could apply for a daily bases. So, actually making data available within the municipality is very difficult because a lot of data is hidden in different departments.

We are now better organised because we are going to work more data steered. In the past, the municipality was organized in columns. Each column had its own IT and facilities. So, it was challenging to get that dataset available and especially dynamic datasets. It turned out that there were around 90 datasets available, but they were hardly used by anyone. By organising hackathons, which Ingrid was also involved, for example with the Hogeschool Rotterdam (College of Rotterdam) these databases can be used and new insights and opportunities can be found. But still, it was somewhat limited. Now, we have a policy that in principle all data is open, but the person who wants to access these data needs to ask for it. Then we will arrange when and how the data will become accessible for this person.

So, the citizen must, therefore, be aware that these datasets are present to gain further access and analyses?

Sometimes, we get a request from someone for data. Then we will, if it permitted, to make the data available in the short term. There is no uniform platform on how to make open data available. At one point, every city had its own data platform or portal. That made it unclear who has what, where and, what the quality is of the available datasets.

What are the expectations about the collaboration between citizens and the municipality of Rotterdam through open data in the future? Can it be expected, for example, that one platform is created where all data can be found or one platform for different cities?

If you look at the Next economy, that is regional economic development. Some experts looked at how the economy would develop in the future over the coming 20 years from now. In the end, a few pillars were defined. One of the first pillars is the Digital Delta, which indicates the importance of the changeability of data. So, we must ensure that we create a sort of regional, preferably national, data exchange platform. In which organisations can exchange data in a much easier way. That, it does not matter whether it is open data or semi-closed or commercial data. As a kind

of library, where you can indicate under which conditions you make that data available, and ownership is arranged. Since, when we give away data, it is no longer in control by us what makes it quite tricky.

Do you also share raw data or more in manageable chunks so that the particular person can better understand the data?

That depends on what is agreed. Recently, someone who had an initiative at City lab 010, to give bootcamp trainings with objects in the city was interested in data. He wanted a list with an overview of all benches, tables and racks and everything else which you could use during a bootcamp. Then, he started to develop an app with these data in which people in the city are encouraged to exercise. This was a very specific question, which we can support, but it is all still coordinated one-on-one now.

And in the future, how do you see an ideal collaboration between the citizen and the municipality of Rotterdam. Would this only be through open data or other forms as well?

I think we should create a data exchange platform. At this platform, data must be accessible in a low threshold way and know in what condition the data can be used. But it is also necessary to have a counter function where you can ask those kinds of questions. We are now working on this on a small scale at 'Hart van Zuid.' The project is called the 'Ruggedised', which is a European project in collaboration with five other cities. At Hart van Zuid, local data is exchanged for local energy generation, who use this energy, data about traffic flows, etc. Currently, KPN is preparing a platform where all these data will be shared, to experiment with this. The idea is then that it is possible to exchange data on this platform together with a diversity of organisation.

Can you compare that project with the project concerning to efficiently collecting household waste by applying sensors?

Yes, that is also part of it. That project is now becoming a more massive project that is rolling out further within the city. A few organizations are working on it together with the municipality of Rotterdam. But you have to negotiate well with those organizations of who will own the data and who is allowed to do something with it. The Dutch market, but also internationally, is very much focused on data ownership. So as a government, we are also taking steps to define it more and more unequivocally. To for example determine under which condition data can be delivered to us, and whom ultimately owns it. There is no standard scheme yet, but they are now working on the initiative, of C & G Bewindvoering, to draw up digital rules for it.

Does the reorganization to realize Smart City Rotterdam affect the network between the citizens and the municipality of Rotterdam?

What you see is that people are increasingly working together incorporation with the neighbourhood. In Noord, we are working for example on the energy issue. It is a learning process with trial and error. But we are indeed making progress.

Are there any bottlenecks among these collaborations? For example, I understood from the Area Networker of the neighbourhood Middelland that the project 'Mooi Mooier Middelland' does not directly fit the organization as it is today.

That's right. Some people, who make that extra step actually thereby lead the rest of the organization, what is good since they stimulate innovation. Not everything succeeds, but by conducting these kinds of projects, we learn a lot that we can take into account and see how our organization can fit into this.

When co-creation will be applied as a method for collaboration, where could bottlenecks be expected?

It is not always said that all citizens are waiting for collaboration or on open data from the municipality. Some, however, prefer to be in contact with the municipality as little as possible. They are satisfied, as long as the household waste can be collected, the streets are safe, and they can park their car.

So, it is challenging to make the final step in which data will actually be used or viewed by the public. Because when someone prefers this form of attitude, I think the chance to make this a success is minimal. Or not?

True. Next, people do not have the means. If you want to do something with data you have to know something about programming or databases or at least Excel tables. And what do you do with it? For many, that is far from their bed to say it that way. But it might be increased if an organization can make data more tangibly or create a toolkit. Less than 1 in 20 has an ICT background. Thus, you have to make it as practical as possible.

I understood that the goal of facilitating open databases to gain trust and openness from citizens. And to strengthen the network between citizen and the municipality. What is the exact definition of data for the Smart City Rotterdam? For example, is it only static data?

Some say that a Smart City is a city which uses data to facilitated and optimized the city for the users or residents. For example, you ensure that the city remains easily accessible or measures air quality and adjusts traffic routes accordingly. But that only works with dynamic data in my opinion. You also see that the data become more and more dynamic. For example, with that project with sensors for the refuse containers and better control over more efficient routes.

The open databases, as you indicated, are barely used. Do you have an insight by who has used the data?

No, we do not know that. But the number of downloads is within dozens, and more are used for fun than its actual purpose. It is essential now to enter into more dialogue with the residents of Rotterdam. How data that we have, for instance, could be visualised? For example, a map can be used to make it easier to understand what is happening. This is now slowly developed to be used as a communication platform. For example, when a project developer would share his construction drawings. Residents can see for instance the influences of the new building on shadow patterns in their neighbourhood. The residents can then indicate that they are against this development. Data would, therefore, give more representation of what the project could look like and what the consequences are when it is realised. As a result, all organizations can have time to make an objection and thus to be more interactive in a direct form.

A6: INTERVIEW WITH THE AREA NETWORKER OF MIDDELLAND

The interview with the area networker is summarized in English. A semi-constructed interview was held face to face with the area networker of Middelland.

A Short introduction about the area networker

Since 2014, Niels works as an area networker of Middelland for the municipality of Rotterdam. The area networker supports the connection and collaboration between the citizens and municipality of Rotterdam. It is hard for the citizens to find the right civil servant for the problems that are needed to be solved. This matter also counts for the municipality towards the right involvement of the citizens. Thus, the area networker is the link between these two worlds.

The area networker works hyperlocal, that means that he works for one neighbourhood. Within this neighbourhood, Niels tries to make the best networker and be open by reaching as many neighbours as he can to build an active networker. In almost every letter the neighbours receive from the municipality Niels is one of the undersigned names, what results in neighbours starting to contact Niels for questions or issues within the neighbourhood. To make contact easy and thereby lower the threshold as much as Niels can, he is also reachable via WhatsApp. Since WhatsApp is considered as a quick way to contact someone. By being able to be reached easily, getting in contact and involve the neighbours in other processes is made doable. Next to this function as a networker creator, a new project has started since 2015, Mooi Mooier Middelland, focused on co-creation. Within this project, Niels supervised the process of the co-creation.

The Interview

How works the application process for the citizens' initiative generally and specifically for this neighbourhood (Middelland)?

I will start with the general process as the co-creation project for this neighbourhood is something unique which is not applied in other neighbourhoods.

Currently, there are three ways to realise your initiative as a citizen in this city; the residents initiative (via Opzoomer Mee), City Lab and, Mooi Mooier Middelland.

Initially, you have small initiatives that focus on the neighbourhood or street. Those are the residents' initiatives, for which a special scheme was drawn up in 2014. The scheme is called residents' initiatives in Rotterdam and is carried out by Opzoomer Mee. Opzoomer Mee is a cradle of low-threshold participation, created in the neighbourhood next to Middelland. In 2014, the coalition agreement spoke for a long time of the 1% regulation, whereby 1% of the municipal budget should be made available to maintain the initiatives of this city. In the end, this turned out a little differently, but at least they started looking at how we can stimulate participation in the city. A change was made, we had sub-municipalities before what converted into local councils. One of the tasks of the local council is to boost participation, and we are very successful at this in the area Delfshaven.

For the residents initiative, you will receive a standard form that you fill out in which you have to collect five signatures from five residents. Subsequently, you submit this form to Opzoomer mee, which brings that form to the local council or me to assess and advise. The initiatives that are sent are very diverse. Often what I do is look at who the initiator is, whom I then call to meet. I always ask two questions; what do you do and why do you want to do that? The answers to the questions give me a good insight into what they wish to do and the why question is only a test to see if the initiative is made with the right motivation. If the answers to both

questions are convincing, I often make a positive recommendation. I always look at whether the budget is realistic. The scheme grants money under € 10.000 that can decide by the local council. When the subsidy is above € 10.000, the area commission can still determine on this, but there are other subsidy schemes attached to it that are needed to be fulfilled (higher accountability requirements). If the initiative has been approved, the initiator must keep the receipts, make a report and take pictures of the result as justification that the initiative has been implemented.

Option two is the City lab. Twice a year you can apply your ideas and go through a process where you get advice and support for your initiative. This option is for larger initiatives with more significant amounts needed to realise the initiative and is there also more expected from the initiatives itself (there must be sound project plans etc.) this often transcends the area and is more focused on the unity of the city.

The third option is Mooi Mooier Middelland. This is a result of outcome in 2014, whereby it was observed that the safety index in Middelland, viewed from the data of the neighbourhood profiles (supplied from OBI, the Rotterdam research office), was slowly shown a decrease. A top-down safety program was organized in Middelland to start solving this matter. After a year, a group of residents indicated that they had no confidence in the project and wanted to take over the project, literally take over. The Mayor of Rotterdam proposed to continue this program in a co-creation context and let the local council and local municipality employees (incl. the area networker) ensure that a plan was made to realise the process of co-creation. At the end of August 2015, the project 'Mooi Mooier Middelland' started. We worked with eight groups consisting of ten to fifteen residents per group. With each group, we tried to connect the right servant and start writing parts of the program together.

A complete programme was defined taken in all parts created. The program describes how we continue the development of this neighbourhood. With an overarching theme; meet and connect. The theme is represented in four places in Middelland. For example, the Johannes de Vouplein, where the square was re-established, activities were organized, social control was tackled, etc. We tried to bring everything together in that place as a joint process through co-creation. With the basis mindset; I do things with the Middellanders (neighbours) instead of for the Middellanders. This sounds logical, but within the context of the municipality, it is hard to realise this mindset rightfully.

By applying co-creation in practice, we immediately discover what co-creation is and in what way we can use it. Adhere, to stick to the guidelines that have been devised in the program. For example, a meeting was organised to redesigning a square. We organized a neighbourhood party to involve as many neighbours as possible. Because of this, we encountered why and when the neighbours experienced the square as unsafe.

In this way, the neighbours did not provide an initiative, because initiative does state that you can understand complex systems and want to go through a long-term project with the municipality. So, you often see that they say the initiators are not representation and also are not included the neighbourhood. So it requires that you have to be highly educated if you want to do business in such complexes. So we are trying to put the initiative back to the street, by organizing low-threshold forms. For many cultures it is not at all considered to be normal, for example, to put your own opinion on the table. By organising other forms of these meetings, neighbours share their view in different ways, to still involve them adequately.

For me, it is really important to take responsibility for the neighbourhood that I work for. That also makes it a demanding job in the sense that I spend 80% of the time here, the neighbourhood is my office where I work, live and, do things. The neighbourhood can address me if something goes wrong or when a problem pops up. As a result, I am really considered as part of the neighbourhood and thereby part of the neighbours. When assessing the initiatives, it is a responsibility to do and realize good things for the neighbourhood.

You mentioned that you assessed the initiative after Opzoomer Mee checked that everything is completed. Do you have an assessment form or list of requirements to review the initiative request or is it purely based on your own opinion?

Both, my view and knowledge as well as finances and social relevance and assessment of whether the goal can be achieved. Because of the understanding of the policy frameworks and problems in the neighbourhood, I can give a proper judgement. Ultimately, the request comes to the local council which eventually decides to accept the initiative or not.

There is a big difference between Mooi Mooier Middelland and further small-scale initiatives on the subject of available budget. But it does not matter whether the initiative is big or small. Every initiative in my view is relevant because I believe in the transition management, which creates a different kind of society. This is now happening through the greater involvement of the residents of Rotterdam, as a result of which the system is slowly changing.

I believe that initiatives and the initiators, who are motivated by a different vision of solving social problems, result in a way better sustainably outcome than we can do as a municipal organization. As a result, I believe that initiatives are the leverage for arriving at other solutions to solve social problems. That is why I think it is essential to link the initiative of residents to the possibilities of the municipal organization. Because thereby allows you to create social solutions that we as a system are no longer able to create.

It is also that in case the initiative is a long process, which you remain involved? Or is it just a few meetings?

Yes, for both small- and big-scale initiatives and, short and long-running initiatives. Because everything is related to a relationship, for me it is a challenge to keep a relationship since a relationship, in my point a view, always is long-lasting principal. That also means that it works in two directions. If, for example, the core of an initiative is good, I help to improve the initiative when necessary. From both sides, this preservation of contact takes place. I certainly even believe in the maintenance of these long-term relationships in connection with improving the neighbourhood and continuous switching to achieve improvement. It is true, of course, when you get to know each other well that you have to keep your professional role as an area networker. Sometimes when a relationship gets too close, for example, I no longer do the advising and assessment and let a colleague take over. However, I often continue to supervise the development of the initiative.

Thus, in Middelland the process is different, but is there further a real difference per neighbourhood? Well, of course, you have the basics. But it is very complicated to answer. But I take my function for example very serious and give this area a lot of support and time as they need, which of course variance with other area networkers and therefore also how it goes in a neighbourhood. I believe that people also make the job, for example, you can describe a role for a job, but how it is filled in is different from person to person. The process is, therefore, the same everywhere in Rotterdam, but the interpretation of it differs. For example, Think about the dimensions of involvement in initiatives. But indeed Mooi Mooier Middelland is a unique project for just this neighbourhood.

Do you also notice that more and more people are submitting initiatives or are this often the same people?

Some people are motivated to do something for the neighbourhood. I do think that you can playfully seduce people to do something for their neighbourhood. But there is a restriction since not everyone wants to be socially active, not all residents wish to do social things. Therefore, for me, it is the challenge to meet new people. Because at a particular moment the question is how long will you stay here as an area networker, considering that at one point you see the same people and with one the process goes through better than the other.

There are many processes and platforms for submitting an initiative, but are there many now that have small issues or missing elements that you think are need to be improved?

Yes, responsibility within a spatial organization, a clear structure that makes it possible to actually make meters. Political involvement outside the mayor. Since the alderman who this program started, is not involved. We often got stuck, and because of this, there is a need for explicit official management. Whoever is involved must also be actually involved. If, in the beginning, the project Mooi Mooier Middelland had a better structure of who is involved and has the overall lead the project could have made more progress.

How would you like to sketch your ideal future regarding citizens participation and collaboration?

In the future, I want to separate from the program money. That means that a lot of things that are happening in this city are fixed in existing budgets. The program money is a kind of extra money to solve a problem. I would find it very interesting to organize a co-creative way of working with standing budgets.

There will always be things that do not involve everyone, but with many tasks that we have to perform, there is room to realize it better by engaging others. So, my ideal future would be that co-creative working is a starting point for everything else that the city of Rotterdam does for the town where it is possible to do something else. Thus, a similar project to what happens here with the project Mooi Mooier Middelland.

Closing question. So you actually get a lot of information, data, within the context from the perspective of the citizens. Regarding this, I wonder, if something is done with data or public data within the initiatives?

The city is indeed also busy with it. But I do not really know much about it. I do think that some initiatives are being developed based on this. Measuring is knowing, but I do more with approximately. Big data is super interesting, but there a lot of data what makes it somewhat complex to work with it. Besides, big data is not the answer to everything. I also believe that you should know how to use big data correctly, which commercial companies, to my knowledge, have a lot more experience with compared to the government.

A7: MUNICIPALITY COLLABORATION PLATFORMS WITH CITIZENS.

Burgerinitiatief loket

Citizens with a good idea can submit their initiative at the 'burgerinitiatief loket' via the website of the Rotterdam municipality. To submit their initiative, a form is required to be filled in. One of its requirements is to be over the age of fourteen and being a resident of Rotterdam (Gemeente Rotterdam., 2014a). The initiatives which can be applied can be based on a neighbourhood, boroughs or city level. To get approval, the initiative might be required to be supported by a minimum amount of signatures (neighbourhood: none, borough: 50, city level: 250)(Bronsveld, & Gemeente Rotterdam., 2016; Gemeente Rotterdam., 2014a). First, the local council shall discuss the initiative proposal substantive level, when approved the city council decides if the initiative gets a final approval to be further developed. In this process, the citizens who are responsible for the initiative has the chance to present their initiative. The citizens will get a final notice of approval for their initiative within thirteen weeks.

Bewonersinitiatief

'Bewonersinitiatief' is created to let the citizens apply for their initiative focussed on improving their street, neighbourhood or borough. The application looks like the 'burgerinitiatief loket' but is more focussed on the ability to ask for a subsidy from ten thousand euro and above (Gemeente Rotterdam., 2015a). To do so, the citizens are asked to hand in a planning, budget plan, and location of the borough where the initiative is related to. The local council decides whether the initiative and subsidy will be approved (Bronsveld, & Gemeente Rotterdam., 2016). The initiator will get a response within eight weeks via email (Gemeente Rotterdam., 2015a). The initiatives will be principally realised by their initiators with a possibility to receive professional support (Bronsveld, & Gemeente Rotterdam., 2016). In addition, other citizens can be involved and work together to enrich and sustain their neighbourhood.

Opzoomer Mee

Opzoomer Mee is for initiatives for neighbours on street level encouraging to care for each other and improve the street. Opzoomer Mee provides small subsidies for initiators who are aiming for small projects as the subsidy which the initiator can request reaches to a maximum of ten thousand euro (Opzoomer Mee., 2015). The goal of this platform is to enhance the network of the neighbours amongst each other and thereby create support to enrich the neighbourhood itself (Bronsveld, & Gemeente Rotterdam., 2016). To apply, the initiator needs to fill in a form similar to the form of the 'bewonersinitiatief' and the neighbourhood council decides whether the initiative will be approved or not. The initiator will get a response within eight weeks (Opzoomer Mee., 2015).

Citylab010

Citylab010 is an online platform for social innovation. The best ideas for Rotterdam are being shared on this platform, proposed by the citizens. Citizens have the opportunity to send their ideas to the platform request a subsidy for their proposal and optionally start a collaboration with supporting organisations (Gemeente Rotterdam., 2017b). The goal of the platform is to strengthen the collaboration between the citizens and the municipality and connect with each other to realise the potential ideas (Gemeente Rotterdam., 2017c). There is a yearly budget of €3.2 million to be spent (Bronsveld, & Gemeente Rotterdam., 2016). Citylab010 is seen as the workspace for the city of tomorrow.

Right to challenge

The Right to challenge is a foundation established to strengthen the collaboration between the citizens and municipality, inspirited by a British platform 'Big Society' (Bronsveld, & Gemeente Rotterdam., 2016). The citizens can take over tasks of the municipality if they challenge the municipality when convinced they can do things better or in a different way (Right to Challenge., 2015; Gemeente Rotterdam., 2016; Bronsveld,

& Gemeente Rotterdam., 2016). For example, improving a neighbourhood facility which can be utilised more efficient then currently is being done. Via this way of working the foundation wants to merge knowledge and expertise of the citizens with the local government. Citizens can apply by filing an online form at the foundations' website which contains a description of the challenge, an approach, end result, neighbourhood, expertise level, stakeholders and expenses of the challenge (Gemeente Rotterdam., 2016). Based on the information provided by the citizens a decision will be made if the challenge is accepted.

MAEX change

MAEX change is a rural platform designed by the 'Kracht voor NL' for social initiatives (Kracht van NL., 2017; Gemeente Rotterdam., 2015b). The mission of MAEX change is to strengthen the world between the citizens (livingworld) and organisation (systemworld). To realise their mission a platform was designed to provide support for the initiators to make them more visible(Kracht van NL., 2017). The support offered by the platform is focussed on backing up finance issues, making initiative visible to others and thereby give the opportunity to easier connect with other organisations (Kracht van NL., 2017). Rotterdam municipality is a partner with MAEX change. The initiators can register their initiative by creating a profile. When making the profile, a questionnaire is required to be filled in to provide a web of added value to the initiative (Kracht van NL., 2017).

A8: CO-CREATION

Co-creation is a team effort of open collaboration between stakeholders to work together to develop a product or service (Fronteer., 2009). Share insights, inspiration, ideas, and strategies make it possible to provide a fresh perspective, touch new key points and connect customers, consumers and partners to deliver new ideas and opportunities (Crandell, C., 2016, 10 June; Fronteer., 2009). The aim with co-creating is to openly and transparently engage customers and jointly create value for all stakeholders involved as a result of the co-creation session (Crandell, C., 2016, 10 June). Next to that, these sessions are giving a perfect occasion to connect and build on to create a network (Fronteer., 2012).

People are willing to participate in collaborative development since they care about products, services, and organisations around them, but need to be triggered to really start participating (Fronteer., 2009). As motivation is a factor which gives stimuli to continue and collaborate, all participants must gain a benefit of being part of the process. What is their benefit and what can they offer you? Creating the right atmosphere to achieve fruitful results is an essential aspect since this will provide a lower threshold to participate and share thoughts. As a starting point for gaining trust and getting familiar with all the participates, an online platform can be used to provide this (Fronteer., 2011).

After making a good co-creation team, to get a rich output of a co-creation session, it is essential to have a clear direction, aim, good motivation and support by others to achieve this output (Fronteer., 2011). The goal which aimed for needs support and a good presentation explaining the need and background behind the challenge to reach it. Defining a clear challenge is the key to make a co-creation process work, as new ideas might pop-up or barriers rise, the challenge must be tangible and clear to be tackled within the session. To provide this, rules are required and will make it easier to give a good outcome (Fronteer., 2009).

APPENDIX

B: ANALYSE

B1: QUESTIONNAIRE FOR PERSONA

Enquête Gebiedsnetwerker Rotterdam

Hi!

Ik ben Anne en momenteel werk ik aan mijn afstudeer scriptie gericht op de ontwikkeling van datagebruik en het versterken van het netwerk tussen burgers en gemeente Rotterdam.

Graag wil ik je vragen om mij te helpen middels het invullen van deze enquête. Met de uitslag van de enquête hoop ik een goed beeld te krijgen van de uitdagingen en/of frustraties in het huidige proces en waar mogelijkheden zijn voor verbetering in de toekomst.

De enquête duurt slechts 5 min!

NEXT

Page 1 of 5

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Enquête Gebiedsnetwerker Rotterdam

*Required

Rol als Gebiedsnetwerker

Hoelang ben je actief als Gebiedsnetwerker van het gebied waar je momenteel voor werkt? *

- ○ Minder dan 6 maanden
- ○ 6 à 12 maanden
- ○ 13 à 24 maanden
- ○ 25 à 36 maanden
- ○ Langer dan 36 maanden

Noem 3 vaardigheden waarover jij beschikt die jou tot een goede Gebiedsnetwerker maken? *

- ☐ Communicatieve vaardigheden
- ☐ Creatief vermogen
- ☐ Doorzettingsvermogen
- ☐ Empathie
- ☐ Flexibiliteit
- ☐ Initiatiefrijk
- ☐ Inlevingsvermogen
- ☐ Kritisch denkvermogen
- ☐ Leidinggeven
- ☐ Observeren
- ☐ Oplossingsgericht
- ☐ Planmatige aanpak
- ☐ Stressbestendigheid
- ☐ Team speler
- ☐ Other: _____

Wat is jouw motto als Gebiedsnetwerker? *

Your answer

Wat is je grootste uitdaging als Gebiedsnetwerker? *

Your answer

Welke problemen of frustraties komen vaak voor en zouden verbeterd moeten worden? *

Your answer

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*Required

Ondersteuning

(Maak een schatting) Ongeveer (1) % van mijn gebied kent mij en (2) % kent mij en weet wat zij of hij aan mij hebben. *

	0	10	20	30	40	50	60	70	80
(1)	○	○	○	○	○	○	○	○	○
(2)	○	○	○	○	○	○	○	○	○

Op welke manier ben je bereikbaar voor de buurtbewoners? *

- [ ] Bellen
- [ ] Facebook
- [ ] Face-to-face
- [ ] Instagram
- [ ] Mail
- [ ] SMS
- [ ] Twitter
- [ ] WhatsApp
- [ ] Other:

Welk van de onderstaande middelen gebruik je om de initiatiefnemers in de buurt te helpen? *

- [ ] Internet bronnen
- [ ] In contact brengen met andere
- [ ] Kennis die je hebt van de buurt
- [ ] Kennis van vergelijkbare scenario's
- [ ] Vergelijkbare scenario's als voorbeeld geven
- [ ] Website van de gemeente Rotterdam
- [ ] Other:

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Enquête Gebiedsnetwerker Rotterdam

*Required

Toekomst

Als je in de toekomst steun zou krijgen van een robot, wat zou deze robot dan moeten kunnen om van toegevoegde waarde te zijn aan jou verantwoordelijkheden als Gebiedsnetwerker? *

Your answer

Hoe denk je over het toepassen van data als hulp voor jou functie als Gebiedsnetwerker? *

	Heel erg mee Oneens	Oneens	Eens	Heel erg mee Eens
Interessant	○	○	○	○
Data kan zeker een bijdrage leveren	○	○	○	○

Maak de zin af: Ik denk dat het interessant is om data toe te passen op

Your answer

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Enquête Gebiedsnetwerker Rotterdam

Einde

Heel erg bedankt voor je hulp en tijd!!

Interesse naar een brainstormsessie met mij en andere Gebiedsnetwerkers over dit onderwerp? Vul dan hier je mailadres in:

Your answer

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B2: DATA

No limitations

As the digitalization of our society will increase dramatically, more data will be collected, available and transmitted to be used (Deloitte., 2015, April 15). As the data stream will increase, it allows getting real-time insights, what makes the boundaries of collecting data become more blurred (Accenture., 2015). The data stream will get bigger, the size of data will grow, and the shape of and sort data will increase. The increase of data, the form in which data is applied and communicated will change dramatically. As the rise of the Internet of Things (IoT), allows devices to connect and let them continually sent and receive data, more data will be collected and available. It is expected that zettabytes of data will be produced annually in 2025 mainly delivered by IoT (Salthmarsh, 2017, November 4).

Real-time insights

Streaming data is highly dependent on the quality of the infrastructure that can collect the data and transform, aggregating, compute, enrich and move it (Google., 2017). Generated through IoT, the stream of real-time data becomes more visible (Saunders, 2017, June 5). The data that is produced by the IoT will be collected by Stream Processing technologies which will integrate, visualise and analyse the data (Saunders, 2017, June 5). This technology makes data insights more tangible and understandable. It will increase the possibilities of responding to changing conditions more rapidly than before. For example, the smart meters in households which provide real-time data on energy consumption and can interactively have control over a household's energy consumption. The device gives the users a better insight into their energy consumption (Future Timeline., 2017) (see figure 59a and 59b).

Privacy and security

Most behaviour in digital form like texting, emailing or visiting websites is being stored in the form of metadata by organisations (Accenture., 2016). Metadata holds elements of the digital form like titles or author or keywords, and it also contains information data of data (Nationaal Archief., 2018; Rayome, 2017, December 21). Metadata is applied to get a better grip on the raw data that is stored and can be used to understand and use data more effectively (Research Data Netherlands.,2018; Rayome, 2017, December 21).

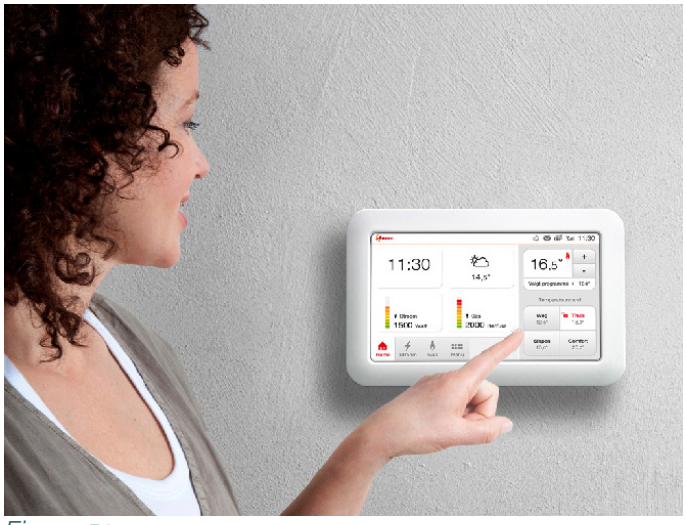


Figure 59a

Figure 59b

Organisations are collecting massive volumes of data (Accenture., 2016), as data has become a crucial asset for them (Tableau., 2017). Most data holds personal information of organisations and people, which makes the security of this data very important. New privacy laws will need to be billed and approved established (Tableau., 2017). A big step was made in May 2018 when the General Data Protection Regulation (GDPR) laws to create protection are legalised within the Europe Union (Ghosh, 2018, January 2; Rayome, 2017, December 21).

The protection of devices is also changing, for example, instead of using passwords, customers are using biometric authorization in forms of a fingerprint scan to get access (Babich, 2018, January 2). It is expected that in the future more biometric authorizations will be applied to ensure and guaranty the security of the devices that are holding personal databases (Babich, 2018, January 2). As customers start to be more concerned about the security of their personal data, accessibility to personal data will change (Accenture., 2016). To maintain easy access to personal data organisations will need to focus on stewardship, transparency, empowerment, equity and inclusion (Accenture., 2016). In this way, a balance will be created to access and protect databases.

B3: TECHNOLOGY

Artificial Intelligence(AI)

AI is a broad technology development field of computer science, psychology, philosophy and linguistics (Van Duin, & Bakhshi, 2017, March 28). The technology is focussed on creating systems in a variety of forms and shapes, like computers or machines, with the ability to do things that would usually require human intelligence (Van Duin, & Bakhshi, 2017, March 28). This technology has a lot of potential to provide new opportunities to fulfil a diversity of functions. Examples of supporting developments within AI are chatbots which give quick and easy support and image recognition. Image recognition has created a lot of new opportunities in the health branch, for example, an invention by IBM to find melanoma symptoms by scanning the human skin for irregularities (Van de Gevel, Broersen, & Wolvius, 2017, May 15). A future example is texting by thought support to make multitasking easier. This technology can be realised by using new techniques as 5G, eye-tracking, and sensor-mounting and by combining these technologies results in the form of virtual telepathy (Future Timeline., 2018).

Another future opportunity is creating content to make sharing information more tangible and thereby build further on trust and transparency (Trevino,2017, September 11). AI technology can sense, reason, engage and learn and communicate in a natural language (Van Duin, & Bakhshi, 2017, March 28). By collecting data and create the ability to let the system start learning and understanding the given data, the system can begin to provide support and be part of solving complex challenges (Trevino, 2017, September 11). Expectations are that AI will become more advanced and common in our daily life (Van de Gevel, Broersen, & Wolvius, 2017, May 15). The technology is expected to process data faster and in this way form stories in just a few hours instead of a couple of days or weeks (Trevino, 2017, September 11).

Natural Language Processing (NLP)

NLP is a combination of AL, computer science and computer linguistic which uses speech recognition and understanding (natural) languages ability to interact a dialogue with other computers or humans (Totta data lab, 2017, September 6). NLP deals with multiple aspects of language to process output to interact (Kumar, R., 2017). As the technology is focussed on interaction via speaking, hearing and reading (Diepen, Sloet tot Everlo, & El Bouazzaoui, H., 2017, April 14; Totta data lab., 2017, September 6). Development over time has made it possible to recognize speech in combination with AI to provide answers to general questions, well known as chatbots and virtual assistants (Van de Gevel, Broersen, & Wolvius, 2017, May 15). Examples of NLP that are already used today are the SPAM filters, chatbots, Grammarly and translation applications (Kumar, 2017). Well known is the rise of assistants like Google home, Siri, Amazon's Alexa or Microsoft Cortana. Google recently made a breakthrough by providing the chatbot with a short-term memory which resulted in more real-life dialogues (Van de Gevel, Broersen, & Wolvius, 2017, May 15). This same concept of assistance is also applied to data analytics (Tableau., 2017). The prospect is that NLP will even start to play a more prominent role within the world of programming languages (Totta data lab, 2017, September 6).

Augmented Reality (AR)

"Augmented Reality is a technique that enables users to interact with their physical environment through the overlay of digital information"
(Grubert, Langlotz, Zollmann, & Regenbrecht, 2017).

AR adds an element to an image of the reality. A good example is the game Pokémon Go (see figure 60). Technology that recognizes objects helps to make that this element can play intuitively with the surrounding as if the element is really there (Grubert, Langlotz, Zollmann, & Regenbrecht, 2017). The potential in the future would be to create an ability to see 'what there could be' like designing a concept (see figure 61), realizing building projects or a kitchen (Mise, 2017, August 9; PWC., 2017, November 13; Barr, 2017, June 26). The technology allows to get easily grip on ideas and share and enhance them (PWC., 2017, November 13). AR could become your personal assistant by giving information when needed, in all kind of different forms via glasses, lenses or smartphones (Mise, 2017, August 9). Expected is that AR will have more major potential in design, training, collaboration, and media and entertainment (PWC., 2017, November 13).

Figure 60

B4: COMMUNICATION

Interactive Visualisation

To intervene in the trend of real-time data, the technology of Visualisation needs to adapt, which results in a more interactive Visualisation (Carto, Hopkins, 2017 October 18). Tools to provide animations and interactive data Visualisation are accelerating resulting in a modern way to reveal the insights of data (Brenner, 2016, October 10).

Figure 61

The interaction of visuals occurs in providing an extra component to the data content (Brenner, 2016, October 10). As new techniques allow non-data users to create good charts, it gives the user exploring the data (Lebied, 2017, June 27). As Lebied, M. (2017, June 27) state:

"By scrolling, clicking and moving the cursor over interesting data points, designers engage users even more and enable them to be a participant, rather than only a viewer, in the data learning process."

Next to use techniques like scrolling and clicking, also command line interface has become interactive, whereby the user commands what the computer must do as the computer interacts on the commands (Bertini, 2017, November 28).

Natural Interaction

As technology is increasingly playing a bigger part of society and technology is becoming more complex, it results in the gap between the young generation and elderly increasing (Hsiao, Lee, Yang, & Chen, 2017). A focus area will be creating more personal preferences and forms of assistance. The technology of NLP is a good example of more natural interaction between human and technology. By using natural interaction, technology becomes more intuitive towards the users (Accenture., 2017). As the interaction between technology and user will become more personalized and natural, the accessibility gap for users will slowly start decreasing (Accenture., 2017). Data is expected to become familiar and quicker to understand by employees (Carto, Hopkins, 2017 October 18). By making the interaction with data feel natural, interpreting the data becomes more accessible and more comfortable to use for anyone.

Storytelling with data

The form of sharing data insights is mainly done via data Visualisation, whereby storytelling within this form of sharing insights is growing (Davenport, 2013, January 31). Through storytelling, insights can be uncovered from data that would else be overseen (Analytics Vidhya., 2017, October 18). Furthermore, stories are one of the best forms of communication for use to remember (Trevino, 2017, September 11).

"Storytelling has a diverse roll in our history as a species and our modern day to day lives but regardless of how and when a story find us one thing rings universally true- the better the story the more valuable it is." (Genauer, 2017, June 13).

Research shows that 74% of the organisations in the Netherlands who are using data-storytelling indicates have a better revenue (Customer Talk., 2017, May 6). Involvement of technology has changed the way we tell our stories today. Modern media and machines enhance the stories into a surreal environment like a story literally come alive (Trevino, 2017, September 11).

B5: LIFESTYLE

Smart City of the future

Around 60% of the people are predicted to be living in cities in 2030 (Philips Lighting., 2018). The primary purpose of the smart city of the future is to improve things for the better of everyone (citizens and environment) and to achieve this get everyone involved (Philips, 2018, January 21). Using technologies like AI, IoT and algorithms will play an important part to establish a new wireless network of smart devices which makes the urban dynamics change on all kinds of different levels (Jaquith, 2017, January 18; I-Scoop., 2017; Philips, 2018, January 21). Initiatives will be enhanced through the involvement of citizens, organisations, and the municipality by collaborating as the technology applied will be serving the citizens (I-Scoop., 2017). Sustainability, health, and psychology have the overhand to steer this future development (Jaquith, 2017, January 18; I-Scoop., 2017). The barriers and problems to make this future perspective realised are the investment and infrastructure that will be needed (Jaquith, 2017, January 18).

Wearables

Expected is that in the year 2020, nine million of the population of the Netherlands will be owning a smartwatch (PwC., 2016a). Next to the smartwatch also other kinds of smart wearables will be on the market which will further stimulate the growth of having such a smart device. Research has concluded that the reason why people are using wearables is mainly to manage their time more efficiently, but also have control and insights over personal data (PwC., 2016b). In addition, these devices are becoming affordable for everyone (PwC., 2016a).

The wearables are becoming part of our daily life, helping us to make better use of our time, be more active and have insights about our wellbeing. Most motivations for owning a smart wearable are: features that give monetary rewards for frequent users, gaming features, provides information about yourself, have better control over money, features that offer loyalty points for frequent users and essential part of wardrobe/ looks cool (PwC., 2016b).

In the future wearables will start interacting with people, people, organisations, and within organisations via IoT applications. The wearables available at the market are equipped with different kinds of functions such as GPS, user-centric applications, biometric sensors focus on our health status, safe and easy payments (ABN Amro pilot: payments by using a ring, watch, bracelet or keychain (see an example of the ring in figure 62)(Abn Amro., 2018))(Mardonova, & Choi, 2018). Expected is that wearables will start to play a role within different kinds of industries like healthcare and mining (Mardonova, & Choi, 2018).

Ideal of happiness and quality of life

An annual report of the human being happiness is published where the definition of happiness is as stated by De Neve, & Ward, (2017):

"Happiness is typically defined by how people experience and evaluate their lives as a whole."

Our happiness satisfaction has a strong correlation with the amount of income, job satisfaction, freedom, honesty, generosity, a trustworthy government, social support and health (Ortiz-Ospina., Roser. 2017). Research in 2017 has shown that the people living in the Netherlands are part of the ten most happy countries in the world (Ortiz-Ospina., Roser. 2017; Better life Index., 2017).

Figure 62

In important development within our happiness is the focus and being conscious of our health and wellbeing (Trend Watching., 2016, April; PwC., 2016b). As Kaushik (2014) states:

"Computers are now taken on roles in almost all aspects of life. People and lifestyles are changing. These changes are sometimes spurred on by technology, but other times work in parallel or provoke technological innovation."

As mentioned in Maslow's hierarchy of people's needs (see figure 63), the matter of our ideal of happiness and quality of life is stated as the highest to achieve (Maslow, 1943).

"Needs at the lower portion of the hierarchy must be satisfied at least to some degree before people can focus on needs higher up"
(Gray, & Bjorklund, 2014).

At the top of the hierarchy of people's needs, people will turn to self-actualization to realise their ideal selves (see figure 63)(Trend Watching., 2016, April; Gray, & Bjorklund, 2014). The motivation refers to becoming the ones full self that the individual can strive for in service of both, itself and others (Gray, & Bjorklund, 2014).

As the market response to this development in the form of consumerism, whereby people can pursue it needs by consuming goods that support this matter (Trend Watching., 2016, April). The fitness wearables are seen as a supporting element to access real-time feedback on our health, daily structure and connecting (PwC., 2016b). For example, making the user aware of symptoms of a starting panic attack, warning the user at an early stage and having the ability to stop it before it happens (PwC., 2016b). Looking at all smart wearables types, 45% of the smart wearables owned are fitness bands (PwC., 2016b). Other examples are booth camp festivals focusing on relaxation and health and an application that is designed to create a daily schedule called 'design my day' which is designed to adapt on your feeling of the day and thereby generate a schedule to feel better (Design My Day., 2017).

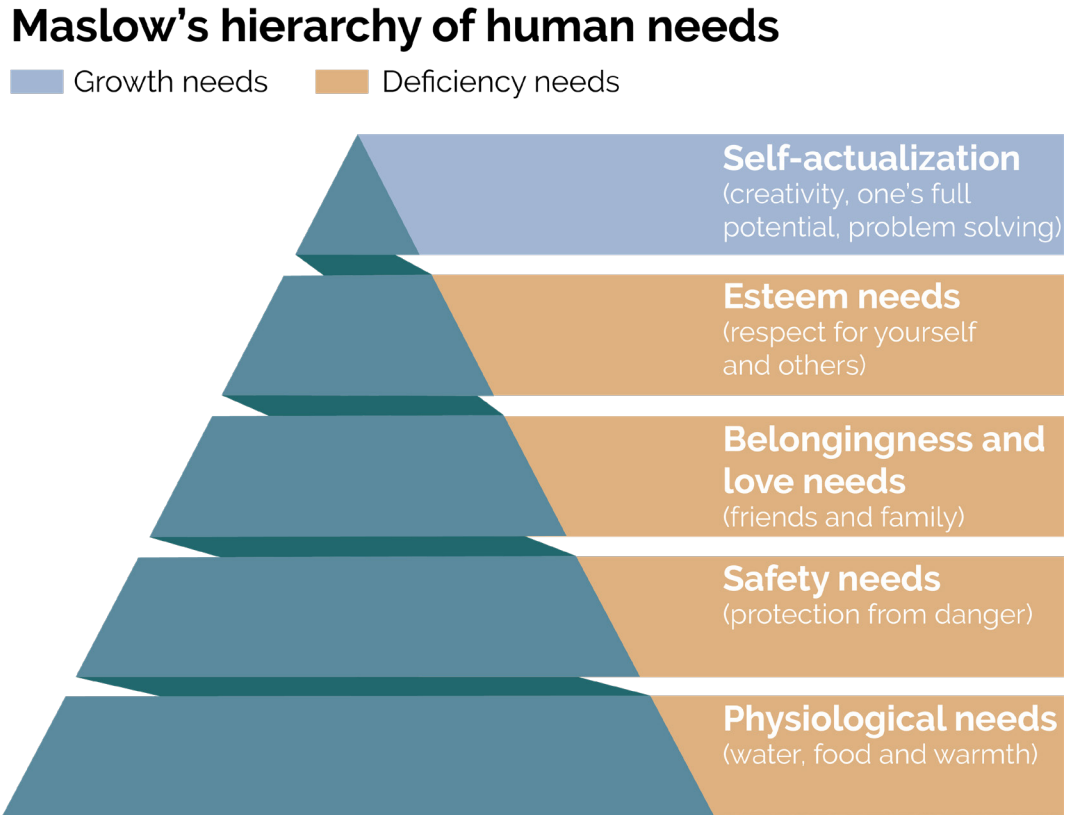
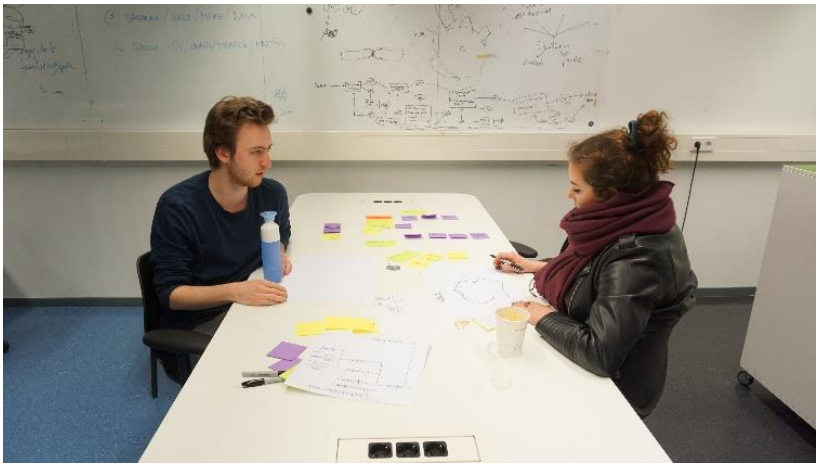
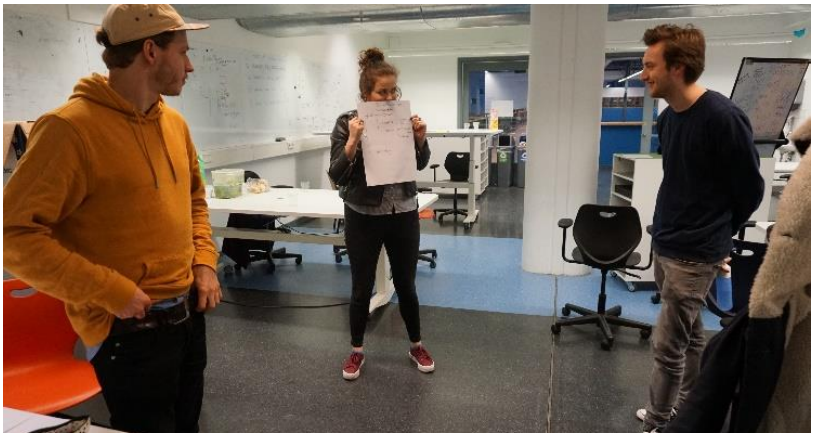


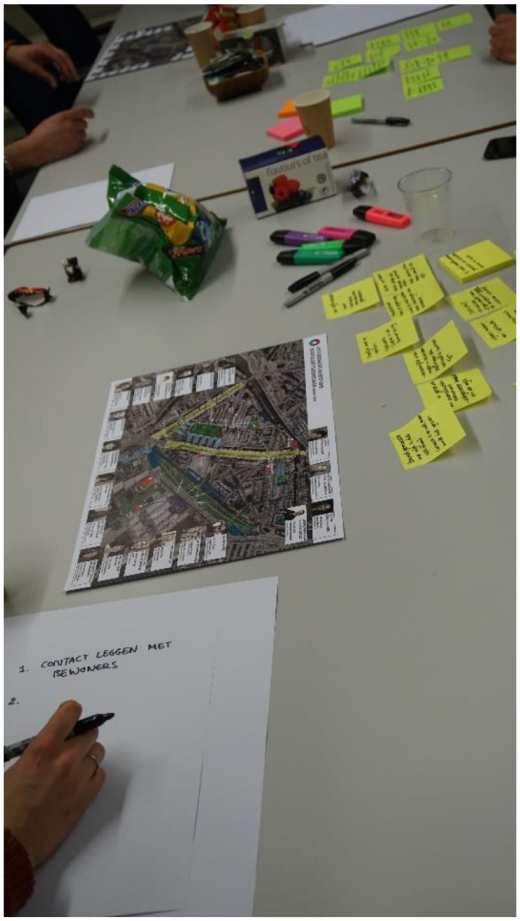
Figure 63

C1: CREATIVE SESSION ONE IMPRESSIONS





C2: CREATIVE SESSION TWO
IMPRESSIONS



D1: QUESTIONNAIRE CONCEPT EVALUATION

ENQUÊTE

Evaluatie van applicatie ‘L.A.M.A’ (local area monitor assistant)

Geslacht

◯ Man ◯ Vrouw

Beroep

◯ Gebiedsnetwerker ◯ Anders

Wat vind je van de applicatie L.A.M.A.?

_____

_____

_____

Zou je L.A.M.A. willen gebruiken om jouw buurt te ondersteunen en optimaliseren?

Ja / Nee *Omdat,*

_____

_____

_____

_____

Gaf L.A.M.A. je een gevoel van controle over wat er afspeelt in de buurt?

Ja / Nee *Omdat,*

_____

_____

_____

_____

Je mag nu uiterst kritisch zijn, wat ontbreekt, kan anders of beter?

(in het kader kan je ideeën voor wat nog ontbreek, verandering, of verbetering tekenen en beschrijven)

Voor het evalueren van de applicatie 'L.A.M.A. wil ik je graag vragen de onderstaande beoordelingslijst in te vullen.

Hierbij moet je het vakje invullen welke het beste past ter beoordeling van de applicatie. Bijvoorbeeld:

De applicatie was leuk om te gebruiken, dan vul het vakje meest dichtbij leuk in:

Niet leuk ◯ ◯ ◯ ◯ ⓧ *leuk*

Onoverzichtelijk	◯	◯	◯	◯	◯	Overzichtelijk
Niet leuk	◯	◯	◯	◯	◯	Leuk
Onbegrijpelijk	◯	◯	◯	◯	◯	Begrijpelijk
Moeilijk in gebruik	◯	◯	◯	◯	◯	Makkelijk in gebruik
Langzaam	◯	◯	◯	◯	◯	Snel
Belemmerend	◯	◯	◯	◯	◯	Ondersteunend
Complex	◯	◯	◯	◯	◯	Eenvoudig
Demotiverend	◯	◯	◯	◯	◯	Motiverend
Inefficiënt	◯	◯	◯	◯	◯	Efficiënt
Onbetrouwbaar	◯	◯	◯	◯	◯	Betrouwbaar
Ontoepasbaar	◯	◯	◯	◯	◯	Toepasbaar
Niet betrokken	◯	◯	◯	◯	◯	Betrokken

Overige opmerkingen of vragen?

_____

_____

_____

_____

TU Delft

OPEN4CITIZENS

European Commission