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Possibilities of a dashboard fuelled with location-based information for monitoring the decentralisations in the social sector

A case study of the municipality of Vught

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Preface

In front of you lies my MSc thesis for the master Geographical Information Management and Applications (GIMA), and is the end product of eleven months of hard work. It was a challenging period from which I have learned a lot; both educationally and personally. The process of coming to this end product was a bumpy ride. My knowledge about the application of dashboards was limited in the beginning while this term 'dashboard' now seems to appear everywhere. This lack of knowledge sometimes slowed down the process, but did not stop me from getting my teeth into this. Some firm setbacks in the end of the research did not stop me as well. I have to admit that I have doubted several times to stop my thesis research without completing it. However, this is not my way of dealing with setbacks, so I continued and conquered these negative thoughts. With result. It is finished. And for that, I have to express my gratitude to a number of people who supported me during my thesis research.

First of all, I want to thank my supervisor Stan Geertman. Thanks for all the very useful, sometimes less pleasant, comments you have made on my drafts and during our meetings. Without these, the product would not have looked as it does today. Our meetings generated new insights that motivated me to continue and finish this research. Thanks for believing that I was able to finish this research when I hit rock bottom at some point. Furthermore, thanks for your patience and willingness along the process.

I would also like to thank GeoCensus and the municipality of Vught. Working in and for an organisation brought me structure in my daily routine and motivated me to work on my thesis on a daily basis. Without this structure, it would never have ended in a 103-page long thesis research. Thanks to GeoCensus and the municipality of Vught for the nice work environment, the nice colleagues and for having patience. Special thanks to my supervisors of GeoCensus, Ron de Vet and Rinus Langerak, who were always there for me when I needed them. Despite their busy schedules, they invested time in me and gave me useful advice when I was out of inspiration. Thanks for giving me the chance to show my abilities.

Thanks to everyone who was somehow involved in this research, let it be as a representative or anyone interested in my research. Last but not least, I would like to thank my parents, boyfriend, friends and fellow GIMA students for supporting me during my eleven-month long bumpy ride. A big thank you for giving me enough, sometimes too many, opportunities to shift my attention away on anything but my thesis.

Enjoy your reading,

Cecile Mathijsen
Terschuur, 22nd of July 2015

Summary

Municipalities are facing a challenge because of the decentralisations that started in the beginning of January 2015. The three decentralisations in the social domain from higher governments towards municipalities result in more responsibility for municipalities: parts of the AWBZ (Algemene Wet Bijzondere Ziektekosten or the Exceptional Medical Expenses Act) are being transferred to the Wmo (Wet maatschappelijke ondersteuning or Social Support Act), Youth Care is transferred and the Participation Law is introduced. The current information provision leaves much to be desired in supporting these new responsibilities. This thesis research investigated the applicability of a dashboard as information provision tool, fuelled with location-based information to monitor local policy and the stated objectives concerning the decentralisations within the social sector.

Smart Cities become more popular nowadays among policy makers. This concept emerged from the modern problems of cities and spews intelligent solutions for dealing with these modern problems. Supporting better decision-making is one of the aims of smart cities. Closely related to a smart city is the production of big data. Directed (e.g. passport controls), automated (e.g. sensors and mobile devices) or volunteered big data (e.g. social media) are produced in large amounts, which has its pros and cons. A lot of questions can be answered by analysing the data, and unknown unknowns are unveiled. However, the large amounts of data cause some challenges. Analysing and processing the data becomes intensive and difficult and enlarges the infringement on privacy. Retrieving the right information out of the bulk is another challenge.

Business Intelligence deal with these challenges to some extent. These application forms present (fact-based) information and data to support decision-making processes. Besides a presentation, decision makers can access, organize, analyse and modify data and information that are considered as relevant for making decisions. Geographic Information Systems (GIS) are integrated more often in the concept of business intelligence to put situations in a spatial context. Geospatial Business Intelligence (Geo-BI), as this combination is called, creates situational awareness and integrates fact data and adds value in the fields of statistics. Dashboards are common decision support systems (DSS) for organisations to monitor the objectives for the organisation. Few (2006, p. 34) describes a dashboard as: “a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so that the information can be monitored at a glance”. The visual aspect of a dashboard is of great importance. A dashboard should simply display information that corresponds to the Key Performance Indicators (KPIs), which are established with respect to objectives, by using graphs, charts, numbers, colours and optionally, a map.

The first step of this thesis was to illuminate the viewpoints of various municipalities on the usability of location-based information in the overall information provision regarding the decentralisations. In general, the representatives of the ten municipalities shared the same viewpoints in the sense that location-based information could definitely add value to the overall information provision. Locating target groups, facilities and certain issues within districts to customise policy were common topics during the in-depth interviews. Getting insight in the current (geographic) situation has priority which be supplemented by more geographically embedded analyses later on to visualise spatial changes and enable future projections. However, the representatives addressed some data issues that complicate the processes. The scarce availability of data, difficulties in data sharing, the privacy-sensitive data,

inconsistent registration and storage are examples of these data issues. The awareness concerning the importance of the data should be raised and agreements should be established to deal with incomplete and low-quality datasets.

The second part of this research was focussed on a case study to investigate the possibilities of a dashboard as information provision tool within the decentralisations. The case study was the municipality of Vught and their goals with respect to the Wmo were the central element of the dashboard. The methodology of Veleva and Ellenbecker (2001) is applied to formulate goals, operationalise these towards indicators and communicate the results. The operationalisation of the indicators was a difficult process partly due to the fact that the municipality of Vught still was in process on deciding the appropriate way of this operationalisation. It was decides to stick to the overall slogan of the Wmo of the municipality of Vught: “As close as possible, as simple as possible”. The municipality has the aim to offer (health)care facilities as close as possible to the healthcare needing clients and to stimulate clients to rely on their social environment when possible. Seven indicators have been selected to cover the overall aim. These seven indicators are implemented in the dashboard environment which was the last part of this thesis research.

The visualisation types which are used for the final dashboard (appendix 9) to represent the seven indicators are (1) a stacked column to represent the amounts of clients per type of regulation developing over time, (2) a circle diagram to represent the proportions of the costs with regards to the overall budget, (3) a histogram to visualise the relation between specialised and basic care and the corresponding demand and supply, (4) the self-reliance radar for every group of clients concerning the different regulations, (5) a map that creates insight in the concentrations of clients and their relation towards basic facilities, (6) the percentage of clients with a shorter travel time than 10 minutes and (7) a score on social cohesion visualised in a metric. The features that the final dashboard should have are focused on making the dashboard interactive. An interactive map with zooming and panning functions, clickable themes to make comparison across districts of these themes possible and an analytical function with regards to the self-reliance of groups of clients should be integrated as interactive features. The starting point of the final dashboard was to keep it simple by using familiar charts with consistency in colour-use to make it comprehensive for the end users.

This thesis research investigated the applicability of a dashboard to monitor local policy and its objectives concerning the decentralisations in the social sector. Various municipalities see the benefits of this approach and have already adopt this method to some extent for the improvement of the information provision within the decentralisations (municipality of Zaanstad, Eindhoven and Tilburg). From these experiences and as an outcome of this research, it can be concluded that a dashboard is a useful and effective tool for monitoring local policy in the social sector. Furthermore, location-based information and data could certainly add value for the information provision in the decentralisations in the sense that they enable a more targeted and customised approach for clients and to distinguish patterns and underlying relationships. However, the main conclusion of this research is that the implementation of a dashboard for this matter can only be successful provided that the objectives and especially the indicators are solid and that the availability of data is sufficient. It should be clear *what* subjects are considered as most important to manage according to the end users. Including indicators on the final dashboard which not cover the objectives can result in disuse of dashboard. The emphasize during the implementation of a dashboard should therefore be on the operationalisation of the objectives.

Abbreviations

ATM: Automatic Teller Machine

AWBZ: Algemene Wet Bijzondere Ziektekosten (Exceptional Medical Expenses Act)

BI: Business Intelligence

BAG: Basisregistratie Adressen en Gebouwen (Key registration for Buildings and Addresses)

BRP: Basisregistratie Personen (Key registration for Personal Records)

BSN: Burgerservicenummer (see SSN)

CAK: Centraal Administratie Kantoor (Central Administration Office)

CBS: Centraal Bureau voor de Statistiek (Statistics Netherlands)

CIZ: Centrum indicatiestelling zorg (Centre assessments healthcare)

DIKW: Data, Information, Knowledge and Wisdom

DSS: Decision Support System

DRIP: Data Rich, Information Poor

Geo-BI: Geospatial Business Intelligence

GGD: Gemeentelijke Gezondheidsdienst (Public Health Service)

GGZ: Geestelijke Gezondheidszorg (Mental Healthcare organisation)

GIS: Geographical Information System

GWS: Geïntegreerd Welzijns Systeem (Integrated Healthcare System)

ICT: Information and Communication Technology

IT: Information Technology

KDP: Knowledge Discovery Process

KPI: Key Performance Indicator

LiDAR: Laser Imaging Detection And Ranging

MAUP: Modifiable Areal Unit Problem

OLAP: Online Analytical Processing

PI: Performance Indicator

PSS: Planning Support System

RDW: Rijksdienst voor Wegverkeer (Public Service for Road Traffic)

SDSS: Spatial Decision Support System

SQL: Structured Query Language

SSC: Shared Service Centre

SSN: Social Security Number

UNS: User Needs Study

UWV: Uitvoeringsinstituut Werknemers Verzekeringen (Institute for Employee Insurances)

VISD: Informatievoorzieing Sociaal Domein (Information Provision Social Sector)

VNG: Vereniging van Nederlandse Gemeenten (Association of Dutch Municipalities)

WIMP: Windows, Icons, Mouse, Pointer

Wmo: Wet maatschappelijke ondersteuning (Social Support Act)

Wsw: Wet sociale werkvoorziening (Social workplacement act)

ZIN: Zorg in Natura (Healthcare in kind)

ZRM: Zelfredzaamheids-matrix (self-reliance matrix)

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1 Introduction

Municipalities are facing a challenge because of the decentralisations that started in the beginning of January 2015. The three decentralisations in the social domain from higher governments towards municipalities result in more responsibility for municipalities: parts of the AWBZ (Algemene Wet Bijzondere Ziektekosten or the Exceptional Medical Expenses Act) are being transferred to the Wmo (Wet maatschappelijke ondersteuning or Social Support Act), Youth Care is transferred and the Participation Law is introduced. Municipalities had to negotiate with healthcare institutions for information about their own citizens that are in need for healthcare. An article in a newspaper from the 12th of September latest, described the issues that municipalities have dealt with: "The solution would be to push one button. The computer then searches for the citizens that receive healthcare and in which municipality they are registered. Piece of cake. All 403 Dutch municipalities will see their healthcare-needing citizens, for whom they are responsible, in a glance" (de Cort, 2014, p. 12). In reality however, this seems to be different. The current information structure cannot provide these desired answers, despite the fact that there is a great amount of data available, partly because of the Dutch key registrations.

For decision and policy makers and their daily tasks within a local government, it could be of added value to have access to a user-friendly monitoring dashboard that represents significant (policy) information in a glance. This terminology "dashboard" is borrowed from a vehicle dashboard (Pauwels et al., 2009). A vehicle dashboard provides the driver useful information about the engine speed, the revolutions per minute (rpm), the oil level or the amount of fuel that is left in the fuel tank. This is essential information that a driver needs to know while he or she is driving. A driver does not need to know at that moment how the oil level is measured. This is also the case for decision and policy makers: they want to understand and gain insight in a specific situation within their municipality, without too much detail. A quote by Dobre and Xhafa (2013, p. 267): "Town planners and administration bodies just need the right tools at their fingertips to consume all the data points that a town or city generates and then be able to turn that into actions that improve people's lives". A dashboard as a tool to fulfil this intention could especially be useful for structuring available information that currently lacks comprehensiveness for everyone involved.

The focus on the decentralisations for this dashboard is suggested by the municipality of Vught. It is a topic example of a policy domain that is in need for more clarity and insight, because of the new tasks. Besides this, integrating location-based information in this sector can possibly lead to new insights on relationships between elements. This could also be the case for other policy domains. The focus on the decentralisations should therefore be seen as a case study. This research will investigate the possibilities of using location-based information within the decentralisations and how this can be represented to make it useful for supporting the implementation of municipal policy.

2 Problem statement and research questions

This chapter includes the problem statement that is central for this thesis. The research questions are formulated in the second part of this chapter, together with the deliverables and the scope of this research.

2.1 Problem statement

The decentralisation of healthcare tasks from higher governments towards local governments leaves local authorities with major challenges because of the significant retrenchments (Visser, 2011). The decentralisation are the result of major cutbacks (€6 billion) deriving from the Miljoenennota and the shift from a welfare state towards a participation society (VNG, 2013). This leaves municipalities with a responsibility to self-interpret these tasks with limited resources. There are three decentralisations (VNG, 2013, p. 4-9):

- Decentralisation Youth Care: since the first of January 2015, municipalities are responsible for the prevention, support, guidance and assistance of youth and it is mandatory to setup policy that covers the decision-making and goals.
- Decentralisation AWBZ (Exceptional Medical Expenses Act) and the new Wmo (Social Support act): personal guidance and support and is transferred from the AWBZ towards the Wmo and there are cutbacks concerning domestic help. It is the aim of the government to offer suitable healthcare that allows people to stay at home instead of living in intramural settings. This results in an increasing need for more municipal facilities and adapted housing. Another aim is to stimulate informal care and the self-reliance of people.
- Decentralisation Participation: the inflow of people for the Wsw (Social workplacement act) has stopped since the beginning of 2015 and based on the Participation act, people who cannot work in a regular environment, can start in a sheltered work environment.

These decentralisations have major consequences for the daily tasks of municipalities. How can municipalities provide qualified healthcare to all citizens within budget? The 'newness' of the tasks let municipalities search for innovative ways to deal with these consequences. The consequences for the (digital) information provision are also radical according to Blankena (2015, p. 30): the administrative burden because of mismatches between substantive information systems and the adoption of the same process before the decentralisations complicates the practice of data sharing between municipalities and healthcare providers. According to Hans Versteeg, project manager information provision decentralisations at the Vereniging van Nederlandse Gemeenten (VNG), the administration across municipalities should be standardised to reduce the burden and to provide better services towards the citizens. Currently 393 municipalities, 6000 healthcare providers and 50 ICT-companies are involved in the process of information provision within the decentralisations. "This is not manageable for municipalities and their ICT", according to Versteeg (Hartholt, 2015). Besides this, the extra administrative activities due to the decentralisations result in higher costs, while the decentralisations had the intention to reduce costs in the social sector (Hartholt, 2015).

2.2 Social and scientific relevance

These examples show the urgency of a solid information provision in the decentralisations of the social sector. The quality of the services must be safeguarded. According to a recent study of I&O Research, the number of Dutch clients that are satisfied with the healthcare of their providers and government

has dropped from 37% to 30% (Kanne and Beerepoot, 2015). A proper information provision can contribute to better services, especially when this information provision is comprehensive, understandable and manageable. This research therefore investigated the possibilities of a dashboard as information provision tool to support policy and decision makers within the decentralisations. Can this contribute to the improvement of services of a municipality?

Dashboards are often used in organisational settings for measuring the performances concerning profits, targets and customers for instance. The organisational focus with regards to dashboards is also noticeable in the great availability of literature for this matter. Dashboards in a governmental setting are rarely discussed in the literature. Maheshwari and Janssen (2014, p. 178) also encountered this and give an extensive explanation for this limited use: the focus of a government on public values instead of profit which makes performance measurement more complicated, the existence of fragmented responsibilities resulting in unfathomable decisions and the involvement of a wide range of actors which impedes the commitment to a successful implementation. The outcome of the study by Maheshware and Janssen (2014) are general design and development principles for a dashboard in the public sector in response to the challenges which derived from a literature study. They stressed the importance of more in depth research on the implementation of dashboards in the public sector. The scientific relevance of this thesis is therefore the more in depth approach on how to implement dashboards in a local government based on their policy objectives. It describes the translation process from these objectives towards indicators and how to communicate the outcomes to the end users.

2.3 Research objectives

This paragraph defines the main research question and the corresponding sub questions. Deriving from the research questions, some deliverables are formulated. The scope of the research is another part of this chapter and will provide an overview of the elements that are taken into account for this thesis, and which elements will not.

2.3.1 Research questions

The aim of this study was to investigate the possibilities of a dashboard fuelled with location-based information that serves as a support tool within the decentralisations of the social sector. The possibilities of this dashboard are translated into indicators concerning the decentralisations and proper visualisations that represent these indicators. The main research question and corresponding sub questions for this research are:

What are the possibilities of a so-called dashboard fuelled with location-based information to monitor local policy with regards to the decentralisations in the social sector?

1. What are so-called dashboards fuelled with location-based information and what are its possibilities and restrictions?
2. In what sense can location-based information and data contribute to the overall information provision of municipalities with regards to the decentralisations in the social sector?
3. Which indicators correspond to the formulated objectives with regards to the decentralisations and in what sense can location-based information add value for monitoring these objectives?
4. What types of visualisations can represent the indicators and what features can support monitoring the objectives within a dashboard environment?

The first two sub questions are more general in nature. The first sub question is answered by a literature study on general practices concerning the use of dashboards, especially within governments, and principles of dashboard design. The second sub question focuses on the contribution of location-based information within the information provision by illuminating different viewpoints of municipalities.

The last two sub questions are focused on a case study, namely the municipality of Vught. The involvement of a municipality gives the opportunity to experience the reality and bring things into practice. The objectives that this municipality has formulated served as the input for further implementations. The process of operationalising the objectives into indicators and integrating location-based information in this process was the focus of the third sub question. The last sub question examined the possibilities for visualisations within a dashboard environment to represent the indicators.

2.3.2 Deliverables

These research questions should have the following deliverables when the research is completed:

- An insight in the possible contribution of geo-information for policy relevant decisions;
- An impression of various municipalities and their progress concerning the information provision within the decentralisations;
- An integration of location-based information within the decentralisations;
- A combination of different (existing) information and data sources to generate new insights;
- More clarity for policy and decision makers because of a clear overview of the current situation and the possibilities and restrictions to retrieve information about situations in the past and future;
- Information that is on the right level of detail to implement policy;
- Recommendations for the type of visualisations that are suitable for the representation of the final indicators.

2.3.3 Scope if the research

This research will not be focused on the technical aspects of linking the different data sources. There are organisations that already dealing with a technical solution for this issue. The focus for this research is to examine the existing and available data within a municipality that can be used for a representation. It will provide insights in the overlap or similarities within the attributes of data sets that will make a join of these data sets possible. It is the aim to investigate the possible contribution of a dashboard to the comprehensibility of local policy, and it is not the aim to get an answer on the question *how* to generate an automatic process for the technical link between different data sources.

Another limitation in terms of the research scope is the focus on one specific part of the transition of the social domain. The case study is focused on the changes within the Wmo and leaves out the other two changes, Youth care and the Participation Law.

The final outcome of this research will not result in an actual working dashboard. This research aims to investigate the possibilities and limitations of implementing a dashboard for municipal policy. What are the current constraints that limit the implementation of a dashboard? What are the functional requirements for the implementation of a dashboard for policy purposes? It is an explorative research, which means that it functions as a first step towards further research and pilots.

3 Theoretical background

This chapter will elaborate the context of the topic and its theoretical concepts. The most important concepts that are of importance for this thesis are elaborated with more detail. Smart Cities, Big Data, Geospatial Business Intelligence, dashboards and different visualisation techniques are examples of these concepts. This chapter will also provide an answer to the first sub question in the concluding paragraph:

What are so-called dashboards fuelled with location-based information and what are its possibilities and restrictions?

3.1 Smart Cities

The concept of Smart Cities has emerged rapidly in the past few years despite of the fact that the concept is not new. According to Harrison and Abbott (2011), Smart Cities emanates from the so-called Smart Growth Movement of the late 1990s. The Smart Growth Movement suggests an approach to manage growth within a city without having negative sprawling effects by emphasising a smart land-use model that strengthens the economy and protects the environment (Daniels, 2001; Miller and Hoel, 2002). Managing challenges that cities face can be seen as the linking element of the two concepts Smart Growth and Smart Cities. The growing number of people living in cities and the effect of this growth on the environment such as pollution can be seen as a driver for making a city smart. Besides the 'negative' drivers, improving the quality of life, competingith other cities and being an innovative city are also considered as drivers (Albino et al., 2015; Harrison and Abbott, 2011; Kitchin, 2013; Neirotti et al., 2014). Defining a Smart City, however, is a more difficult task because of the lack of a "one-size-fits-all definition" and variants of concepts such as 'digital cities', 'intelligent cities' and 'wired cities' (Albino et al., 2015, p. 4). A definition given by Harrison et al. (as cited by Albino et al, 2015) in an IBM document embraces the main aspects of a Smart City in the three terms they use: instrumented, interconnected and intelligent. Capturing real-time data with sensors and personal devices refers to the first term. The data that is gathered by these sensors is interconnected into a single platform which gives the possibility to communicate among other city services or platforms. The term 'intelligent' refers to the analyses and visualisations of the integrated data to support better decision-making. There are a lot of definitions of Smart Cities and Albino et al. (2015) have reported 23 definitions of different authors. They drew the conclusion that the concept of Smart Cities is not mainly focused on Information and Communication Technology (ICT) anymore. Hollands (2008, p. 315) states that cities must see the importance of integrating people and human capital: "Progressive smart cities must seriously start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities". The extensive study of Albino et al. (2015) of different literature about Smart Cities revealed that most of the descriptions nowadays also include the 'soft' aspects of a Smart City (e.g. qualities of people and communities) as well as the 'hard' aspects (ICTs). Depending on the needs and habits of a city, ICT is shaped by local governments and their political choices and cities therefore differ in implementations of a Smart City (Neirotti et al., 2014).

3.1.1 What is smart?

Besides the existence of many definitions of a Smart City, there are many different views on the adjective 'smart'. When is a city a Smart City? Komninos (as cited by Hollands, 2008, p. 305) gives four definitions of the adjective 'smart' (or intelligent): (1) the implementation of digital applications within

cities, (2) using information technology to positively transform regions, (3) the embedding of ICT within a city and (4) the spatial areas where people and ICTs meet each other which leads to innovations and problem solving. These definitions are technical oriented but the implementation of ICT does not necessarily means an improvement of the city. The smart part of a city could also refer to innovative ways of delivering services and communication towards the citizens without explicitly mentioning ICT (Neirotti et al., 2014). According to Nam and Pardo (2011), there are three dimensions that together make a Smart City. The first dimension is Technology which refers back to related concepts such as digital or wired cities. The second dimension is focused on People/Human with Creative City or Learning City as relatives. These conceptual relatives emphasise the importance of people, knowledge, education and the competitiveness between cities in the global economy. A third dimension is focused on institutional factors. 'Smart government' is seen as a key component for a smart city, which means an interdisciplinary collaboration and an efficient way of managing resources (Nam and Pardo, 2011, p. 287). Figure 1 shows the main components of a Smart City according to Nam and Pardo (2011). Although the technical predominance in definitions of a Smart City, it is not the main component that makes a city 'smart': "a city cannot simply be labelled as smart by adopting a sophisticated information technology infrastructure" (Hollands, 2008, p. 316). It is the relationship between the different dimensions that makes a city smart or intelligent.

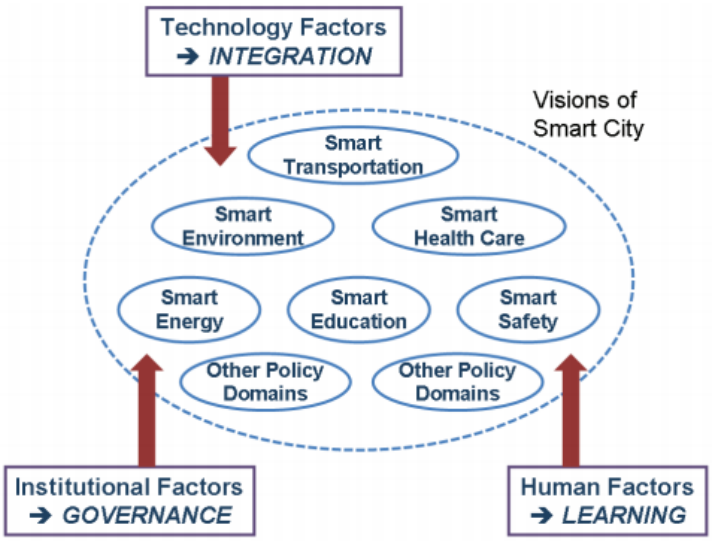


Figure 1. Core components of a Smart City (Nam and Pardo, 2011, p. 288)

This figure suggests that not only technical factors are of importance for the concept of Smart Cities because institutional and human factors also have an influence on making things 'smart' in a city. However, the adjective 'smart' mainly "captures the innovative and transformative changes driven by new technology" (Nam and Pardo, 2011, p. 288). Many definitions of a Smart City use this 'technology-pushed' approach, which is the assumption that the supply-sided process of technological innovations will lead to innovative uses (Peters et al., 2012). Smart Cities use new technological developments to deal with (nowadays) problems or situations. These problems or situations are also interpretable as demand-pulling factors. From this perspective, the modern problems *demand* new technological innovations. Therefore, it is necessary to bear in mind that a focus on technology should not overlook the real problems and demands that drive technological innovations (Peters et al., 2012).

3.2 Big Data: challenges and opportunities

The Smart City concept is adduced for his thesis because of one significant aspect of a Smart City appointed by Kitchin (2013, p. 12), namely the "production of sophisticated data analytics for understanding, monitoring, regulating and planning the city". The production of these data can derive from three different sources according to Kitchin (2013, p. 4): directed, automated and volunteered. The first refers to the generation of data in a form of surveillance where a specific person or place is the central element of the data collection purpose, for instance passport controls or LiDAR technologies. Automated data are the most common forms of data production in a Smart City. This includes the use of sensors for sensing the environment, actuators, mobile devices and transactions across digital networks. The third category, volunteered data, is the generation of data that consists of interactions on social media and crowdsourcing initiatives such as OpenStreetMap. All these 'smart' solutions produce large amounts of data, referred as big data. This term is defined in many different ways. For this thesis, the definition given by Kitchin (2013) is applied because it nicely recites the characteristics of big data: they are huge in volume, high in velocity, diverse in variety, exhaustive in scope, fine-grained in resolution and indexical, relational because of common fields that enables joining different data sets, flexible and scalable (Kitchin, 2013, p. 3).

Being huge in volume and having great diversity, processing this data results in difficulties when using traditional data processing approaches (Philip Chen and Zhang, 2014). There are more challenges when dealing with big data: storing, sharing, analysing and visualising the data (Philip Chen and Zhang, 2014). The current processing tools seem not to handle these large amounts of data. They state: "If we cannot surmount those challenges, Big Data will become a gold ore but we do not have the capabilities to explore it, especially when information surpass our capability to harness" (Philip Chen and Zhang, 2014, p. 318). Furthermore, security and privacy issues are raised by big data. Processing large amounts of data, including personal information, is beneficial in many ways, but enlarges the infringement on privacy. Sensors that trace people and their behaviour, location-based data gathered by mobile devices and social media expose information about individuals and raises the question for what purpose this data is gathered and used and by whom. Weber (2015) also addresses this issue for government data which is of great importance for this thesis. Under administrative laws, governments are collecting data of their citizens (taxation information, registration of cars, residency etc.) with the aim to implement their tasks in more efficient ways for better services. However, as Weber (2015, p. 238) states: "with the collection of more and more data the risk increases as to its effect on the privacy of an individual when combined with other data or disclosed to the public under a freedom of information request". This is something to bear in mind during the research, because of the personal (healthcare) data and information that is combined, analysed and visualised.

Despite the challenges, big data also have a wide number of advantages. More flexibility in decision making, determining unknown unknowns and a wider range of questions that can be answered, increasing operational efficiency and more suitable services are some examples of these advantages (Bhimani and Willcocks, 2014; Philip Chen and Zhang, 2014). According to Philip Chen and Zhang (2014) policy and decision makers need to see the potential big data can have in their sectors. Big data have the potential to increase the effectiveness and efficiency for city management and regulation (Kitchin, 2013). As literature suggests, big data have great potential for decision support but there is the underlying risk that big data are (automatically) produced without a specific purpose. The added value of big data derives from analysing these data and when big data serves as inputs for further

analyses (Power, 2014). Big data can only be valuable when it is possible to analyse and interpret the data (Zaslavsky et al., 2013).

3.2.1 Big Data vs registered (government) data

The data used for this thesis are government data, as defined by Weber (2015) and can be appointed as directed big data (Kitchin, 2013). A specific person is the central element of the data collection purpose. These government data are, among others, stored in the Netherlands in the so-called System of Key Registrations (Stelsel van Basisregistraties). The system consists of 11 key registrations (see appendix 1) and contains personal, financial, cadastral and topological data for instance. In accordance with the privacy issues of Big Data, these government data are also privacy-sensitive as Weber (2015) stated. Especially personal healthcare data which are used for this thesis deal with these privacy issues. The Basisregistratie Personen (BRP - Key register for Personal Records) contains personal information about citizens, such as name, address, nationality, civil status, parents and children, travel documents and voting rights. Referring back to the definition of Big Data given by Kitchin (2013), some of these characteristics also apply for registered (government) data:

- *Diverse in variety* (which refers to structured or unstructured data which are often temporally or spatially referenced [Kitchin, 2013, p. 3]): government data about citizens is gathered for many different purposes and in many different fields in a certain timeframe or with a location component (the Basisregistratie Adressen en Gebouwen – BAG for instance).
- *Exhaustive in scope* (covers an entire population for instance): the BRP covers all the inhabitants of the Netherlands, or non-inhabitants of the Netherlands but do have a relation with the Dutch government which makes this data exhaustive in scope.
- *Fine-grained in resolution and indexical*: every key registration contains a number of attributes and some are more detailed than others. The key registrations are indexical because of the unique identification numbers that are mandatory to use. A Social Security Number (BNS) or a BAG ID, which uniquely identifies a BAG object or a premises.
- *Relational in nature*: because of the unique identifiers and the returning use of these, it is possible to combine different data sets to gain new insights and retrieve new information.

Because of these similarities, the concept of Big Data is adducted for this thesis. The awareness towards the availability of large amounts of registered data should be raised across decision makers to make proper use of these data.

3.3 From data to knowledge

The concept of big data coexists with the theoretical DIKW (Data, Information, Knowledge and Wisdom) hierarchy. T.S. Eliot (1934) was the first author ever hinting the hierarchy in this field. The hierarchy was (further) developed by Cleveland in 1982 and adjusted several times by different authors. Data was not hinted in the original hierarchy by Eliot and was later added by other authors. As figure 2 shows, data are just raw data and do not have meaning on their own. Jifa and Lingling (2014, p. 816) give a good example of raw data: “Like someone has a lot of bricks, cement, wood and steel and when you do not have help from a good designer, you cannot transfer them into a real construction”. Information is often needed for further interpretation. The so called DRIP syndrome, ‘data rich’ but ‘information poor’, which is a common characterisation of decision-making organisations (Driedger et al., 2007), is discouraged in this way.

According to Jifa and Lingling (2014), information is giving context to the data, and knowledge is the collection of useful information on how to use the data and information. However, knowledge is connected to a person and varies per individual. What may be knowledge for one person with its own objectives, might be regarded as data or information by another person (Batra, 2014). As Batra states (2014, p. 6): "Considerably subjectivity comes into play for an observer to conclude whether a particular entity can be termed information or knowledge". Some authors have also added the process of understanding between knowledge and wisdom. This is a process of combining the knowledge that someone already has with new knowledge or knowledge of another individual. Jifa and Lingling (2014) give the argument that when dealing with big data, you should try to let people understand and utilise these data. Understanding data and information is therefore a crucial element in converting it to something usable. The top of the hierarchy is wisdom, but this concept is rarely discussed in the literature about the DIKW hierarchy. Gackowski (2012, p. 108) confirms this statement: "Wisdom must be so illusive and controversial that even the editors of the Encyclopedia Britannica did not offer a separate entry for it". He describes wisdom as "the sum of knowledge acquired through the ages". The hierarchy in figure 2 includes 'understanding' because this seems to be an even so important, or perhaps a more important, process in the development of usable information. It is about understanding the data and information and knowing how to apply it. This will automatically give answers to the questions *when* to use it and *why*.

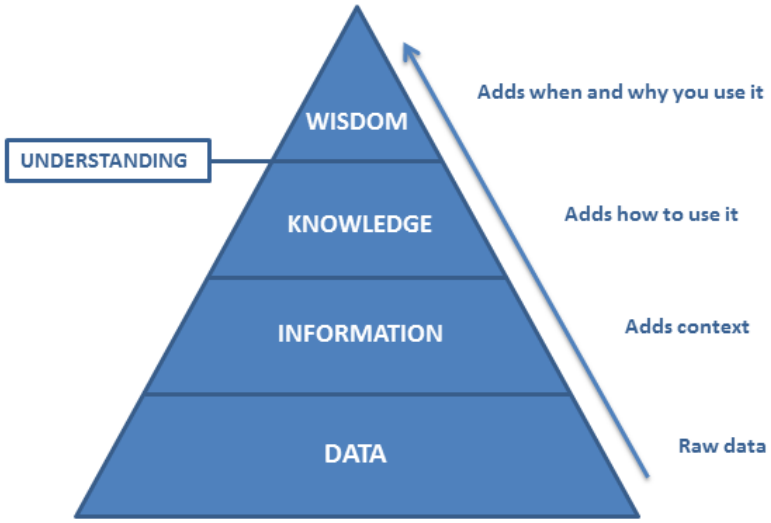


Figure 2. DIKW hierarchy (adapted from Jifa and Lingling, 2014; Hey, 2004)

A drawback of this hierarchy is that it suggests that a higher level within the hierarchy is preferable above the lower levels. This is not necessarily the case, because raw data that is processed towards information can be sufficient for interpretation in some cases without going to the next higher level. It therefore depends on the data type that is being used and for what purposes to determine the right level within the hierarchy.

3.4 Geospatial Business Intelligence (Geo-BI)

Business Intelligence (BI) is a concept that was introduced by Luhn in 1959, quoted by Sauter (2010, p. 53):

> "*Business* is a collection of activities carried on for whatever purpose, be it science, commerce, industry, law, government, defence, et cetera. The communication facility serving the conduct of a business (in the broad sense) may be referred to as an *intelligence system*. The notion of *intelligence* is also defined here, in a more general sense, as the ability to apprehend the interrelationship of presented facts in such a way as to guide action towards a desired goal".

Another, less expanded, definition is given by Moss and Atre (2003, p. 4). They focus on the architectural character and the tools or applications for supporting decisions that define BI. Data mining, geospatial analyses, digital dashboards and visualisations are examples of activities that are facilitated by decision-support applications according to Moss and Atre (2003). The goal is to improve the performances of decision making. Fact-based decision making is a term that is often used for the definition of BI. The data and facts that derive from this data provide decision makers with information of current or historical situations and allow them to make the decisions based on these facts (Sauter, 2010). BI is therefore closely related to Decision Support Systems (DSS), which are computer-based systems that integrate information from different sources and allow decision makers to access, organise, analyse, modify and evaluate data and information that they consider as relevant for making decisions (Sauter, 2010; Coutinho-Rodrigues et al., 2011). It is an integration of databases, analytical models, graphic visualisations and the expertise of decision-makers that supports a decision-making process (Geertman and Stillwell, 2004). A DSS differs from a Planning Support System (PSS) because PSS are used to support planners' activities and the corresponding long-range problems they deal with, while DSS have the overall aim to support the decision research process by using integrated information and data for analytical modelling and visualisation (Geertman and Stillwell, 2004). Considering this given distinction of a PSS and a DSS, the DSS is more relevant for this thesis since it is the aim to find an appropriate arrangement of visualisations for policy and decision makers that can support them.

A Geographical Information System (GIS), a software package that can be used for analysing geospatial data (Kraak and Ormeling, 2010), can be an element of a DSS. These are defined as Spatial Decision Support Systems (SDSS) which integrates spatially referenced information in a decision making environment to support decision making for complex spatial problems (Coutinho-Rodrigues et al., 2011; Geertman and Stillwell, 2004). A GIS is especially useful to place complex situations or events in a spatial context (Geertman and Stillwell, 2004). Wickramasuriya et al. (2013, p. 80) adapted the combination of a GIS and BI as Geospatial Business Intelligence (Geo-BI): "an improvement on the traditional BI approach made possible by integrating a GIS with BI". This merge of GIS and BI technology allows a combination of spatial data and analyses and map visualisations with traditional BI tools, and aims to support decision makers in making more informed decisions (Badard and Dubé, 2009). In general, these two components are two different approaches, while it is imaginable that a combination of the two generates a higher level of information. A standalone GIS analysis provides decision makers with useable information and serves as a DSS in itself, however BI adds value in the field of statistics and in establishing linkages between data (Geluk, 2011).

3.5 Visualisation of data

The aim of visualising data is to communicate information on a clearly and understandable way using graphics (Dur, 2012). An addition to this aim given by Cleveland (as cited by Dur, 2012, p. 278): "The human brain is more able to identify and comprehend relationships and patterns if data is encoded into visual forms. Graphs allow us to explore data and observe patterns that no other approach can achieve". This section will elaborate the general visualisation do's and don'ts related to interpretation and privacy for instance. The second part of this section will go into detail about dashboard design.

3.5.1 Visualisation techniques

Information visualisation techniques or methods that have been developed in the last decade can be classified into three main dimensions defined by Keim et al. (2003, p. 2-7).

(1) The data type that is visualised: examples of data types are one-dimensional (temporal data), two-dimensional (geographic data which contain an X and Y dimension) or multi-dimensional data (data sets that contain more than three dimensions, such as relational tables). Besides these three data types, more complex data types are formulated: text or hierarchies/graphs. Text data types are complex because these do not consist of numbers. Hierarchies and graphs represent the data records that are related to other information or data records.
(2) The corresponding visualisation technique: Keim et al. (2003) adduced several visualisation techniques that considered as standard, such as plots with X and Y data, maps and graphs in different forms (e.g. bar charts, histograms, line graphs). Scatter plots, data visualisation in the form of an iconic and pixel values with different colours are considered as more complex data visualisation techniques.
(3) The used interaction technique: navigating through and further analysing the data can be possible when specific interaction techniques are used. Filtering, zooming, linking or distorting are examples of these interaction techniques. These techniques are useful when a user needs further investigation in some part of the data.

These three dimensions are orthogonal, which means that "any of these visualisation techniques may be used in conjunction with any of the interaction techniques for any data type" (Keim et al., 2003, p. 2). Besides this, different data types can use a combination of different visualisation techniques. The information visualisation techniques suggest a solution for the difficulties in large data set explorations. As stated before by Cleveland, visualisations make the human brain more able to understand the data, the visual data mining techniques emitted by Keim et al. (2003) also result in a less complex way of getting insight in the data.

Liu et al. (2014) adopt quite the same starting points for information visualisation techniques as Keim et al. (2003). They also state that the type of visualisation is determined by the data type. Liu et al. (2014) distinguish graph visualisations, text visualisations, map visualisation and multivariate data visualisation. Data that consist of elements and a relation or connection between elements can be visualised using graphs, either static or dynamic. Dynamic graphs are powerful to use for data that changes over time. Text visualisations can be applied to visualise individual or a collection of documents. According to Friendly and Denis (2008) and Chin (2007), this can be referred to as information visualisation, which is the visualisation of non-numerical information. Detecting topics or keywords within documents is the method of gathering these data and a popular visualisation technique is a projection. This spatially arranges the data and represents the relationships between

the topics or keywords (Liu et al., 2014). Geo-spatial data visualisations have grown since the introduction of GIS in the 1990s. Different map types, such as choropleth and density maps, and the upcoming use of 3D can be supportive for decision makers. Visualisation techniques for multivariate data are for instance pixel-oriented and icon based (Keim and Kriegel, 1996 as cited by Liu et al., 2014). All these visualisation techniques for different data types are (to some extent) corresponding with the ones that are distinguished by Keim et al. (2003). However, Liu et al. (2014) use a more extended explanation for interaction techniques. They distinguish two categories: WIMP (windows, icons, mouse, pointer) interactions (e.g. selecting, filtering, highlighting, brushing and navigation) and post-WIMP interactions (touch interfaces). Especially the WIMP interaction functions can be of interest when working with dashboards. It gives the user the ability to interact with the presented data.

3.5.2 Geographical data visualisation

As stated earlier by Liu et al. (2014), GIS has gained great interest for policy and decision makers as a supportive tool. GIS are integrated in the process of urban planning and its issues and for finding solutions because of the fact that "a high percentage of information managed in public sectors is geo-referenced" (Tao, 2013, p. 25). A GIS has the power to analyse spatial data directly and to combine different data layers (Tao, 2013). Spatial data differs from other sorts of data because spatial data "refers to objects or phenomena with a specific location in space and therefore have a spatial address" (Kraak and Ormeling, p. 3). Spatial data objects can be of point-, line-, area- (polygon) or volumetrically shape, however the shape of the data depends on the scale or resolution (Kraak and Ormeling, 2010). For some scales the data will be most suitable in point shape, while on another scale a polygon would do best. A final visualisation also depends on the type of attributes the spatial data contains. These attributes can be of nominal (languages) , ordinal (warm – mild – cold), interval (temperature) or ratio scale (distance) (Kraak and Ormeling, 2010). Visualising these geo-spatial data and information on a map has a number of advantages (Kraak and Ormeling, 2010): maps can help in the decision what to analyse, how to act upon this and communicate the final decisions; maps can support exploring data sets and discovering patterns and relate them partly due to its visual form.

There are thematic and topographic maps. Thematic maps display the distribution in space of one phenomena, and topographic maps give an impression of the Earth's surface. Roads, rivers, vegetation and names of these objects are often part of a topographic map. Choropleth maps, dot maps, graduated symbol maps, isoline maps and catrograms are examples of thematic maps. Statistical data is often represented using these thematic maps (Kraak and Ormeling, 2010). Maps as decision supporting tools can be of added value to manage a city in a more efficient way (Tao, 2013), however the steps that lead to the added value of a map or GIS solution have to be fulfilled without errors. Kraak and Ormeling (2010, p. 187) nicely cover these steps: "have the proper data been selected for the map, have these data been visualised in the correct way, did the map user perceive the mapped information in the intended way, and did she derive the correct conclusions from the mapped image?". The next section will go into detail about the factors that need attention when mapping data and information.

3.5.3 Issues on mapping geographical data

Some caution is needed when dealing with and drawing conclusions based on maps. A map is still a visual representation of a phenomenon in real life. If the map is interpreted in the intended way

depends on the right choice of visual techniques, such as map types, the use of symbols, colours and the level of detail. This section will give a brief explanation of some common issues when dealing with the visualisation and interpretation of spatial data.

Openshaw and Taylor in the late 70s introduced the concept of the modifiable areal unit problem (MAUP). This concept illustrates the problem of the generation of different results during analysing aggregated data, while the same analysis is applied, but with different aggregation schemes. The MAUP can be subdivided into two sub-problems. The first is the so-called zoning problem which occurs when the shape of the aggregation units is different but with a fixed scale of analysis. Figure 3 shows this zoning problem which results in different outcomes of the analysis, while it is the same data that is being analysed, but with different demarcations of areas. The second sub-problem is called the scale problem: "the variation in results that can often be obtained when data for one set of areal units are progressively aggregated into fewer and larger units for analysis" (Openshaw, 1984, p. 8).

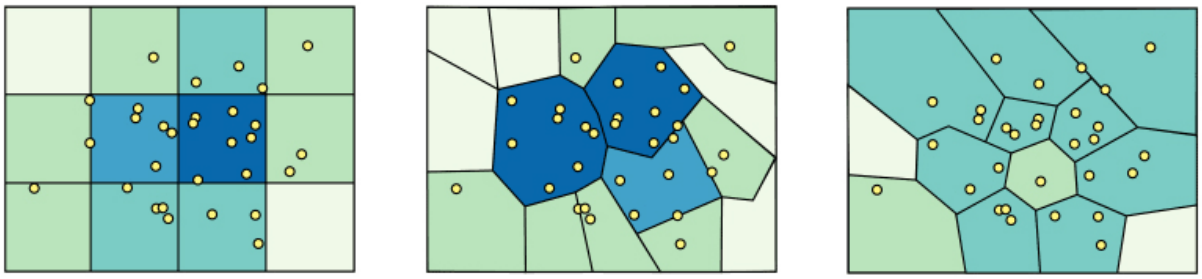


Figure 3. MAUP zoning problem (Ervin, 2015)

The MAUP is closely related to the ecological fallacy problem, which refers to a mistaken conclusion of analyses of group data that are generalised towards individuals (Winzar, 2015). It occurs when results that are based on zoned or grouped data are applied to the individuals that form that zone or group (Openshaw, 1984). The individuals are assigned with the average characteristics. An ecological fallacy can therefore be seen as an error concerning the generalisation of outcomes.

Generalising and changing the scale or resolution of data is not a mistake in every case. In some cases, maps are so complex that they need a generalisation. For instance, a thematic map that represents a socio-economic phenomenon of a country must not include rivers in the map. Generalisation of data can also be of added value when it comes to privacy issues. Personal data for instance, which is defined by the Data Protection Directives as "information relating to an identifiable natural person who can be identified, directly or indirectly …" (Kulk and van Loenen, 2012, p. 199), must not be traceable towards the individual. When representing personal information on a map, by using an address for instance, some form of generalisation is needed. Choropleths or heat maps are examples of possible generalisation techniques for personal data.

Using colours for mapping data can be effective to transmit an argument, statement or for comparing data, such as with choropleths. However, the choice of a specific colour or colour scale (gradient of colours, e.g. from green to red) is therefore of great importance. According to Schulze-Wollgast et al. (2005) there are three factors that influence the choice of a right colour: data properties, the visualisation goal and the general context. As mentioned earlier, data variables can be of different types, such as nominal and ordinal. Because nominal data types have no order, using a colour scale is

not right. Nominal data variables should be represented with distinctive colours. Ordinal data variables on the other hand, must be implied with a colour scale. Examples of visualisation goals are comparison of data in different time steps or regions, highlighting specific values of the data and detecting clusters or correlations. The latter factor, general context, concerns the colour perception and user preferences for instance. As Schulze-Wollgast et al. (2005) state: "when visualisation is used to communicate facts found in the data among users of different cultural backgrounds, the relevance of user preferences is even increased". They refer to the differences in associations that some cultures have with a specific colour. For instance, the colour red is associated with life in India and with death in Egypt (Schulze-Wollgast et al., 2005).

3.5.4 Dashboard design

A definition given by Few (2006, p. 34) emphasises the visual aspect of dashboards: "a dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so that the information can be monitored at a glance". Dashboard design covers the design of functional features, which describe what the dashboard can do, and the design of visual features. These latter features refer to the data visualisation principles and thus, how information is presented towards the user (Yigitbasioglu and Velcu, 2012). Richardson (2009) and Lechner and Fruhling (2014) offers some useable guidelines on how to design practical dashboards. Richardson focuses on the do's and don'ts of dashboards. The literature review of Lechner and Fruhling investigated specific dashboard guidelines and how these can be applied in the medical field.

- Make a dashboard actionable to allow the user to retrieve more detail about the presented information. The earlier discussed WIMP interactions such as clicking, selecting, filtering and highlighting can be applied here.
- Only present the measures (e.g. charts and gauges) that correspond to the Key Performance Indicators (KPIs), otherwise the dashboard will be disused.
- A dashboard should be able to refresh the data content more often than once a month. It depends on the goal of the dashboard what the frequency of updating should be, however, users should be able to see changes over time. Richardson (2009) therefore suggest the use of a time slider to make these changes visible for the users. Lechner and Fruhling (2014) also advocate the use of historical data in order to provide a complete picture of a situation.
- Too many dials equals an information overload. Richardson (2009): "it is hard for humans to process lots of information feeds at once – a basic rule of thumb is to use no more than seven objects on a dashboard". He gives the example of aircraft cockpits because these are graphically simple and standardised.
- Use familiar chart formats and keep them simple. Some chart formats are readable by most users of dashboards and some demand more expertise. 3D charts for instance add no value according to Richardson (2009), "they only look cool". Familiarity was also one of the guidelines that was found in the literature review by Lechner and Fruhling (2014). They state that the guideline 'adherence to convention' "can be thought of as systems adhering to the same look and feel across the entire user interface and using familiar, established user interface elements" (Lechner and Fruhling, 2014, p. 56). This statement suggests to use the same sort of 'lay-out' as for the previous system to make the new one an easy-to-learn dashboard, but is quite irrelevant if there is no earlier version.

- Make dashboards 'real'. Richardson (2009) argues that using geographical maps and BI together resonates with the dashboard users. A map "provides situational awareness" (Lechner and Fruhling, 2014, p. 57) that can be useful for interpretation.
- The use of colours alone should be applied with care to avoid different perceives of colours. Combining colours with shapes and positions will avoid this.
- (small) tables are allowed to be used for dashboards, however no more than a 7x7 matrix. Tables provide more detailed information about some issues than simple graphs. A dashboard should allow this.
- Pie charts should be handled with care because they seem to be hard for interpretation and comparison. If pie charts are used, no more than six segments are allowed.

According to Bharosa et al. (2010), the final design of a dashboard depends on the purpose of the dashboard: strategic, tactical or operational. The strategic type of dashboard is based on tracking achievements of objectives. Analysing and benchmarking are elements of a tactical type of dashboard. An operational dashboard monitors performance indicators in real time (Ganapati, 2011). Which of the three that is choses depends on the main stakeholders and their goals.

Yigitbasioglu and Velcu (2012, p. 52) argue that the design should be based on certain rules instead of the users wishes: "whether the data are categorical or quantitative, whether the tasks are about comparison or identification of trends or totals, and whether the end users are experts or casual users of graphs". The advantage of 'excluding' the users to some extent is that the final design will not disappoint a fraction of users that where included. Excluding them can possibly result in limited options for the end-users.

Concerning visualisations possibilities for dashboards, Yigitbasioglu and Velcu (2012) suggest to use a single page or single screen type of dashboard with a limited number of colours, a high-data ink ratio and grid lines for (simple) 2D or 3D graphs. There should be a possibility to get a bird's eye view of the overall performances, as well as the accessibility of more detailed information (Yigitbasioglu and Velcu, 2012).

3.6 Dashboards in practice

(Geo-) Business Intelligence (BI) knows several analytical applications, such as data warehousing, Online Analytical Processing (OLAP), data mining, scorecards and dashboards (Chen et al., 2012). The latter is the main element of this thesis. Dashboards provide organisations with information of key performances on a visual and orderly manner that supports operational decision making (Pauwels et al., 2009). One of the reasons to develop a dashboard in an organisation is the "tension between the abundance of (marketing) data at our disposal and the lack of actionable insights that derive from it" (Pauwels et al., 2009, p. 175). Decision-relevant data is often poorly organised according to LaPointe (as cited by Pauwels et al., 2009, p. 176). A dashboard is useful for monitoring performances within an organisation and to change course when necessary. Besides this, a dashboard is helpful for planning goals and strategies and to measure if these are achieved (Pauwels et al., 2009). Integrating different data sources, e.g. out of one big database or many different databases, is something that characterises a dashboard and is especially helpful in de big data era. Key Performance Indicators (KPIs) are needed for the measurement of the goals an organisation sets: "… a term for a measure or metric that evaluates performances with respect to some objective" (Barone et al., 2011, p. 82). As

Barone et al. (2011) state, KPIs are important elements for the determination of the objectives formulated by an organisation, such as strategic goals or requirements concerning quality. For instance, an organisation wants to increase the number of clients in the next year. The KPI for this objective could for instance be: Increase number of clients with 10%. This is a KPI that includes a measurable value which is useable for the presentation on a dashboard. A pre-condition of a KPI is that it should be measurable to some extent, otherwise it is not possible to determine whether the goal is achieved or not. The same applies to the goals or objectives formulated by municipalities.

3.6.1 Practices abroad

The applications of dashboards within local governments or cities is not a new phenomenon. This section gives a short overview of some abroad implementations of dashboards within local governments and their experiences. The chosen dashboards for this section represent different perspectives on, motives for and implementation forms for the use of this type of business intelligence.

The Obama administration approach

The first example is focused on five operational cross-agency and agency-specific dashboards in America: one IT dashboard, two financial transparency dashboards and two agency-specific dashboards. The Obama administration has the approach to create dashboards to make sense of the great amount of data that is available nowadays to make it sensible for decision makers. From an assessment of these five cases Ganapati (2011) distilled four lessons concerning the application of dashboards within a government setting:

1. Data quality is the key to credibility for the measured performances: to guarantee data quality, a standard for data definitions would improve the quality and thus the credibility.
2. Best practices are necessary in the design and use of dashboards: every approach towards and technical possibilities for a dashboards are different, but a guideline with best practices could improve the quality of dashboard design.
3. The performance measurements should reflect the organisational goals: the usability of dashboards will increase when the performance indicators align with the goals.
4. Dashboards are just the tools, their effectiveness depends on the use: dashboards are only tools to visualise specific data and *how* these dashboards are used will determine the effectiveness of them.

Reflection

After studying these governmental dashboards, it seems that they all use their own visualisations and designs (see appendix 2 for examples). Some visualisations (e.g. the IT Dashboard) are very complex in the sense that it takes some time to understand the essence of the information. There are a lot of options and filters that gives you the ability to make a suitable query, however it is more easy to get lost in the data. Contrary to the IT Dashboard, the financial dashboard (see appendix 2) is less complex because of its simple visualisations. It nicely integrates a map and gives the ability to retrieve more details when necessary. Instructions on how to use the dashboard and corresponding map make it user-friendly.

Illawarra region, Australia

Wickramasuriya et al. (2013) have developed a dashboard as a Geo-BI solution which informs planners, policy and decision makers about water-related issues in the coastal Illawarra region, New South Wales in Australia. The dashboard they developed is called the SMART Infrastructure Dashboard (SID) to integrate data and information of the private and public agencies to enable integrated cooperation between the five Local Government Areas (LGAs). The public and private agencies are data providers and users of the SID. This SID is especially focused on spatial analyses with different time dimensions: year and seasonal intervals. This gives the users the ability to analyse situations within time. The dashboard also has the ability to facilitate what-if scenarios. The users can estimate an impact of changes within independent variables on dependent variables (Wickramasuriya et al. 2013). Having the ability to analyse possible future trends can be very helpful for decision makers in this process, because anticipation on these situations will be more easy. Wickramasuriya et al. (2013) state that in current Business Intelligence solutions the ability to make projections is lacking.

Reflection

The dashboard consist of three interactive reports (map, spider charts and a bubble chart) with filters to change the region, year and season (see appendix 3). These three reports have a drill-down option to display more detail. The overall appearance of the dashboard seems user-friendly, however titles that give information about what is represented are missing. It more seems to be an arrangement of visualisations, rather than an interactive dashboard.

London

London has developed a dashboard that represents real-time data towards citizens about the weather, public transport delays, the availability of city bikes, the stock market, social media trends within London and so on (see appendix 4 and 5). The city dashboard has an option to view all these things on a map as point data with pop-ups for more information. Besides this real-time data dashboard there is a dashboard that contains administrative data with 16 topics: Art and Culture, Business and Economy, Championing London, Crime and Community Safety, Demographics, Education, Employment and Skills, Environment, Health, Housing, London 2012 (Olympic Games), Planning, Sport, Transparency, Transport and Young People (see appendix 6). These topics contain for instance infographics, images, reports about surveys and data sets with, among others, outcomes of these surveys. As Kitchin (2013) states, these two dashboards provide visualisations that ease the interpretation of the data for non-expert users ad give the ability to easily envision future scenarios within the city.

Reflection

The two London dashboards discussed here differ greatly. The city dashboards presents real-time statuses of the city, while the administrative dashboard presents developments over time of different topics with a reflection towards the mayor's aims. The city dashboard combines information and data from different resources to one overview that is slightly packed, however informative. The map viewer with clickable real-time point data is not that meaningful, because of the hardly interpretable pop-ups. The administrative dashboard uses different graphs to represent the developments within the concerning topic and gives a well-informed overview at a glance.

Atlanta

The starting point for the implementation of a dashboard in the city of Atlanta is more in line with the aim of this research. The aim was to develop a performance-measurement system which measures municipal performance and by this, managing the city to improve efficiency and effectiveness of services. It was decided to involve the strategic priorities established by the major to measure to what extent these priorities are accomplished. However, the project faced a challenge during this process which was the lack of metrics to assess success. According to Edwards and Thomas (2005), private organisations deal with more financial metrics for measuring their client satisfaction and a public organisation deals to a lesser extent with these metrics. Therefore, they used a Citizen Satisfaction Survey to hunt down opinions about public safety and liveability. The survey led to four key indicators that each were disaggregated. Due to the Atlanta Dashboard policy and decision makers where able to follow a more targeted approach on issues that were identified (Edwards and Thomas, 2005).

Reflection

The appearance of this dashboard is very similar to the administrative dashboard of London (see appendix 7) because of the use of different graphs. Both case studies are good examples of how to apply and use dashboards in a (local) government. The objectives formulated by the major served as starting points for the development of the final dashboard. However, it seemed in the case of Atlanta that the operationalisation of these objectives and making them measurable is not that easy.

3.6.2 Practices in the Netherlands

The idea of using policy dashboards within Dutch municipalities was already adduced by van Willigen (2005). He had the same starting points as for this thesis: the lack of significant information and the abundance of reports with the progress of projects and activities concerning a specific policy goal. Van Willigen (2005) hints two types of dashboards: one focused on an overall overview of finances, projects and indicators, and one dashboard that represents the relations between the efforts and the corresponding outputs. These dashboards represent information at a glance, with possibilities to retrieve more detail. However, according to van Willigen (2005) there is a factor that obstructs the development of dashboards for policy purposes. The current reporting methods used by municipalities are not in line with the needs of management teams or the executive board to actual direct situations (van Willigen, 2005, p. 16).

Factlab of Zaanstad

Zaanstad has started in 2012 with a so called Factlab, which concentrates on the information provision of decentralisation-related facts. There was the desire to get insight in the distribution of healthcare facilities among citizens. Is there a concentration of people with facilities in specific districts of the municipality? Are there households that have more than one healthcare facility and where are these cases located? These questions could not be answered at that time, because the needed information was scattered across different organisations and authorities. The Factlab was developed to shape the decentralisation policy and to adjust this policy to the needs of citizens (Valkhoff, 2012). However, a proper interactive presentation of these facts deriving from the Factlab is missing. Only (large) charts and graphs where used to represent the results.

Aristoteles Living Lab in the Netherlands

This case study well-describes the overall process of developing a dashboard and the evaluation of it. Bharosa et al. (2010) describe a Living Lab case that uses dashboards for crisis management. A Living

Lab is an innovative platform that involves all stakeholders in the development process and can be seen as a user-centred methodology (Bharosa et al., 2010). Researchers, policy and decision makers and end-users of different departments where all involved within the process. For instance the fire and ambulance department, the emergency control room and a board of majors where included. The project consisted of five phases: (1) exploration and generation of relevant performance indicators (PIs), (2) prioritising the Performance Indicators (PI), (3) developing the dashboard, (4) evaluation of the dashboard and (5) the implementation with feedback possibilities.

Seven dashboards were developed for all different stakeholders with their corresponding Performance Indicators. The dashboards contain graphs, traffic lights and tables with colours as visualisations for the indicators. After the implementation and test phase, the overall conclusion of the Living Lab dashboard was that the users were satisfied and were planning on using them in practice. The majority of the users felt that the dashboard did help them in preparing for a possible crisis. However, the alignment between the formulations of the Performance Indicators and the context of use required more attention according to the users. Bharosa et al. (2010, p. 189) therefore draw the following conclusion based on their research: "One of the main experiences is that the high level of uncertainty regarding the final set of performance indicators and the corresponding norms demands flexibility in the dashboard architecture beyond the evaluation stage".

Safety dashboard Eindhoven and Tilburg

The main aim for developing a safety dashboard was to raise the safety of citizens and to reduce the number of criminal incidents. Available data about offences, victims and criminals within the municipalities of Eindhoven and Tilburg are plotted on a map. Concentrations within neighbourhoods of such data can be discovered easily and gives an impression of the most common offences. This allows the municipalities to choose the most suitable approach to raise the safety within that area (Geonovum, 2014a). This safety dashboard is based on a ESRI map which enables analyses and more detailed information on district level. According to the developers of this safety dashboard, it helped to improve the safety index of the municipalities because of the more targeted approaches to deal with issues. However, there is no evaluation available of the end-users which confirms this statement.

3.7 GIS and healthcare related information

In a report written by Bregt et al. (2014) a future perspective of the geo-information sector is presented. It is stated that locational information is properly suitable for visualising developments and creating overviews. After all, 80 percent of data have a spatial component (Bédard et al., 2006). Underlying causes of developments can be indicated with locational information which incites the society to respond (Bregt et al., 2014). This also applies for the social domain. The main opportunity according to Bregt et al. (2014) for the combination of location-based information and healthcare is the spatial optimisation of supply and demand for healthcare, to generate suitable and less expensive healthcare.

It is not a new phenomenon to combine locational information with healthcare related information. The use of GIS within healthcare derives from 1854 with the pioneering study by John Snow. In this year, there was a cholera epidemic in a specific area in London. Snow assumed that people could be infected with cholera by drinking infected water. However, this infection theory was never described nor proved to be right. Snow visualised the victims of the cholera epidemic on a map and it became clear that most of the victims were appointed to the same public water pump, and this pump was

assumed to be infected with the cholera virus (Snow, 1855). This famous example of using GIS for healthcare related issues shows that it can be a dignified way to encounter a problem. A remark made by McLafferty (2003, p. 25) also underpins the added value of GIS in healthcare: "GIS and related spatial analytic techniques provide a set of tools for describing and understanding the changing spatial organisation of healthcare, for examining its relationships to health outcomes and access, and for exploring how healthcare delivery can be improved".

These examples show the contribution geography could have for the social domain. City governance and politics can be supported by location-based information. Almost every service that a municipality offers is related to a location, but the location has a subordinate role in some cases (Geonovum, 2014b). This is especially the case for the social domain or healthcare. Policy makers in this field of politics are often not aware of the added value that geographic information could have for their field. But the current developments regarding the transition can possible change this perspective. The transition is a dominant and challenging development for the geo-sector (Bregt et al., 2014). Municipalities will have more responsibility for the healthcare-related issues. The transition of the social domain causes some difficulties, because municipalities have to implement these new tasks and responsibilities with fewer resources than had been budgeted before (van Kempen, 2012). Efficient healthcare policy is therefore necessary and it is of interest to examine the contribution of a dashboard in this situation.

3.8 Conclusion

This chapter had the aim to provide an introduction to the overarching concepts of this thesis and to highlight the possibilities and restrictions of dashboards. With this, an answer to the first sub question is established:

What are so-called dashboards fuelled with location-based information and what are its possibilities and restrictions?

According to Few (2006, p. 34) a dashboard is "a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so that the information can be monitored at a glance". Dashboards are a smart way of monitoring objectives, translated into Key Performance Indicators (KPIs), by visualising aggregated data in a simple, understandable and manageable way. Nowadays, location aspects are integrated in dashboards more often and give shape to the term Geospatial Business Intelligence (Geo-BI). Using location-based information for monitoring objectives can positively influence the situational awareness. In general, the use of dashboards becomes more popular within governmental settings as shown by the examples to monitor objectives of a region or city. However, the term 'dashboard' seems to be misplaced in some cases as they do not function as you would expect a dashboard to work. The (technical) possibilities seem endless, but the final implementation seems to be more complex.

4 Methodology

This research is executed in association with GeoCensus and the municipality of Vught. The municipality of Vught served as pilot study for this research. The reason for the involvement of a municipality as a case study is because of the need to investigate current issues, the information structure, the availability of data and to be able to bring things in practice. Besides this, the municipality of Vught did not started yet with an integration of location-based information in the decentralisations. This research was an opportunity to have a close look at the possibilities in this field. This chapter elaborates the process of this research and the methods per sub question that are used for the completion of this research.

4.1 In-depth interviews

In order to generate an extensive overview of different viewpoints on the contribution of location-based information within the information provision of the decentralisations (sub question 2), various municipalities are approached. It was the aim to illuminate their view on the use of location-based information and to what extent these municipalities already use this sort of data and information. This approach is comparable with a User Needs Analysis (UNS). A UNS can be described as: "by means of interviews, questionnaires, observing existing work processes and analysing data flows, a project team attempts to determine the demand for GIS" (Reeve and Petch, 1999, p. 53). This definition is specifically based on a GIS which is not the intention for this research, however the approach for this research was to determine the demand for location-based information within the decentralisations. The UNS method that is most suitable depends on the level of detail that is needed for understanding the users' needs. General perceptions of users can be identified using interviews or surveys, but specific details about the users behaviour requires a user test or survey (Garrett, 2011).

The latter approach was not necessary for the purpose of this research. In-depth interviews with 10 municipalities, including the case study Vught, provided enough detail to get an overview of the issues that arise within the decentralisations and current trends in application forms and information provision. Table 1 shows the representatives of the municipalities and the justification why these municipalities are approached. The municipalities vary in size and are located in different parts of the Netherlands to ensure an extensive overview and to illuminate different viewpoints. Two of the 10 municipalities are Living Labs for the Information Provision Social Sector (VISD) and are experimental environments that allow municipalities to investigate requirements within the information provision of the social sector, develop prototypes and serve as best practises (VISD, 2015). The municipality of Zwolle is working on pilots on how to use factual information presented on maps to as indicators support decision-making within the municipality (Geonovum, 2013). Most of the municipalities are proposed by GeoCensus because of good business relationships with these municipalities.

Subjects within the decentralisations that can be supported by location-based information according to the representatives, data issues, (organisational) limitations, visualisation possibilities and the potential use of dashboards in this domain were topics during the in-depth interviews (see appendix 8 for the interview questions and topics and appendix 10 for the processed interviews). In most cases, two representatives attended the interview: one of the (geo-)information department and one operating within the social domain. These interviews with different representatives resulted in an overview of common issues, questions, objectives and application forms within the decentralisations in both fields.

Table 1. Approached municipalities for in-depth interviews

Municipality	Representative(s)	Justification
Bernheze	Michiel van Loon – Hans Schuurmans – Lia Cortenraad	Encountered on regional meeting named Gemeentelijk Geo-beraad Oost-Brabant
Capelle aan den Ijssel	Arjan van Etten	Proposed by GeoCensus
Eindhoven	Heidi van der Vloet – John Lenz	Living Lab Information Provision Social Sector (VISD)
Schijndel	Silvy Horbach – Carl van der Pol	Municipality in merger process with Sint-Oedenrode and Veghel
Shared Service Centre de Kempen (Bergeijk, Bladel, Eersel, Oirschot and Reusel-De Mierden)	Peter Duijve	Proposed by GeoCensus and covers several municipalities simultaneously
Tilburg	Paul ten Have – Mabel Giesbers	Proposed by GeoCensus
Vught (case study)	Netty Verhagen – Willemijn Verhave – Jeroen Verhagen – Ilse Cremers – Margareth van Heesch	Proposed by GeoCensus
Velsen	Hans Blom – Roel Reuvekamp	Proposed by GeoCensus
Zaanstad	Mark Smit	Living Lab Information Provision Social Sector (VISD)
Zwolle	Marcel Broekhaar	Fact-based policy using indicators and geographic maps

4.2 Determination of objectives and indicators

The outcome of the depth interviews served as background information for the rest of the research process. As mentioned before, the municipality of Vught was the case study and their objectives and indicators are used for further processing for this thesis. A model developed by Veleva and Ellenbecker (2001) is used for the process of defining the indicators based on given objectives (see figure 4). First, the objectives were operationalised into performance indicators. This operationalisation means a concretisation of questions or objectives by indicating how elements will be measured (Boeije et al., 2009). Steps 1 to 4 of the model covered the operationalization of the objectives. Step 5 was dominated by data gathering and processing. The sixth step covered the visualisation of the indicators. The last two steps of the model are not included because it is out of the scope of this research. The 8 steps according to Veleva and Ellenbecker (2001, p. 531) are shortly addressed here.

(1) This step is dominated by the development of goals and objectives that possibly reflect a mission that an organisation has. For the case of this research, these goals and objectives are related to the new Wmo which are formulated in an agreement and by representatives of the municipality of Vught.

(2) The identification of possible indicators are the central element of the second step. The number of indicators depends on the goals and objectives. It is the aim to let the indicators cover these defines goals and objectives. It was the aim to establish these indicators together with the representatives of the municipality of Vught, however this had a different outcome.
(3) In the third step, some of the identified indicators are chosen for implementation. This means that several indicators are chosen based on being the most suitable indicators for the defined goals. These indicators are used for further process.
(4) The fourth step involves setting the targets to the goals. Targets are the measurable values that define when a goal is reached, for instance: "reduce the number of accidents with 20%". According to Veleva and Ellenbecker (2001), this is an important step of the model because it ensures commitment within an organisation. However, hard targets do not always determine whether a goal is reached or not. Without these targets it is also possible to estimate if an organisation is on the right track for achievement.
(5) The intensive data collection, calculation and interpretation of the results is the fifth step and is most time-consuming. Determining the type of information system and software that is used to process the data and the final analyses are also part of this step.
(6) The sixth step is dominated by the communication of the results to other employees or interested parties. Veleva and Ellenbecker (2001) state that it is important to periodically communicate the derived results from the indicators in order to achieve a goal. In the case for this research, this step involves the visualisations of the data derived from step 5. The aim is to visualise this data in such a way that the users are able to interpret the results more easy than when the data unprocessed.
(7) In this step, the organisation acts on the results derived from step 6. These actions will be suitable for achieving the goals since the indicators are defined based on these goals.
(8) The indicators, goals and policies are adjusted when necessary to achieve the best results. These two last steps are not included in this thesis.

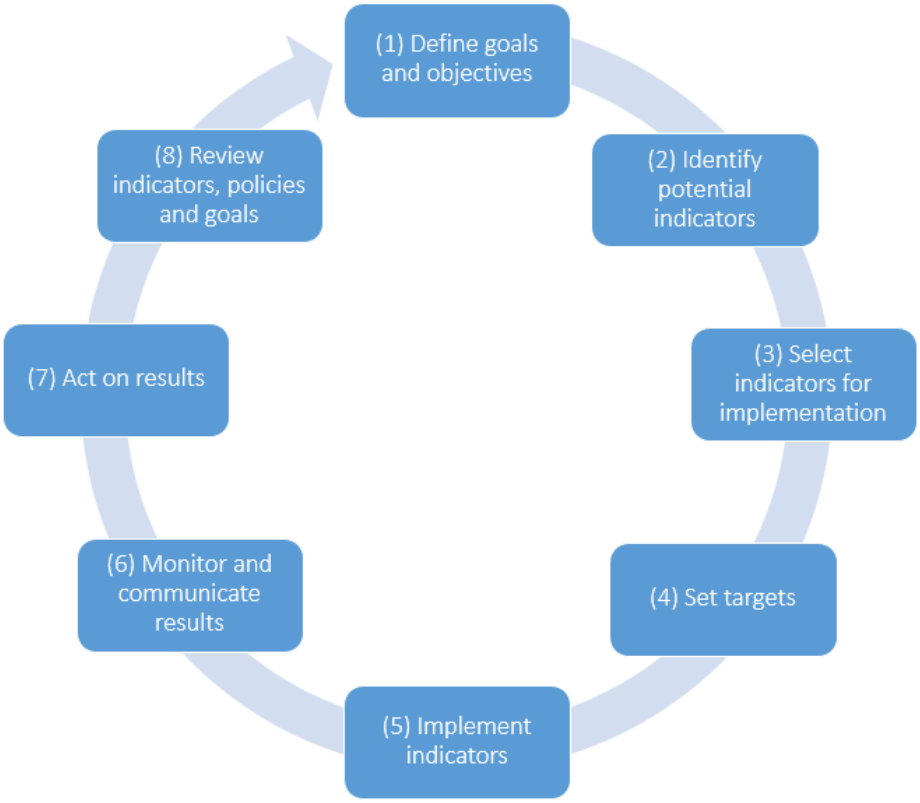


Figure 4. Model for the definition and measurement of organisational indicators (adapted from Veleva and Ellenbecker, 2001, p. 531)

4.3 Location-based information and data

Data collection, mining and processing are core elements of the fifth step. Based on the formulated indicators the required data is retrieved out of different data sources. As mentioned by Zarsky (2013), policy makers are facing the challenge to structure databases with personal information and use this for other purposes such as promoting law enforcement and stability. The main aim is to retrieve 'new' information out of existing datasets by combining these. Referring back to the concept of Big Data, the term data mining comes into the picture. This is "the process of discovering useful patterns and trends in large data sets" (Larose, 2014, p. 2). The aim for this research was to envision the information that could be of interest for the purpose of use, to extract these data or information out of different data sources and to finally discover patterns within these data sets. More important, perhaps, was linking data out of different data sources to make it more informative by producing new information with the ability to discover patterns.

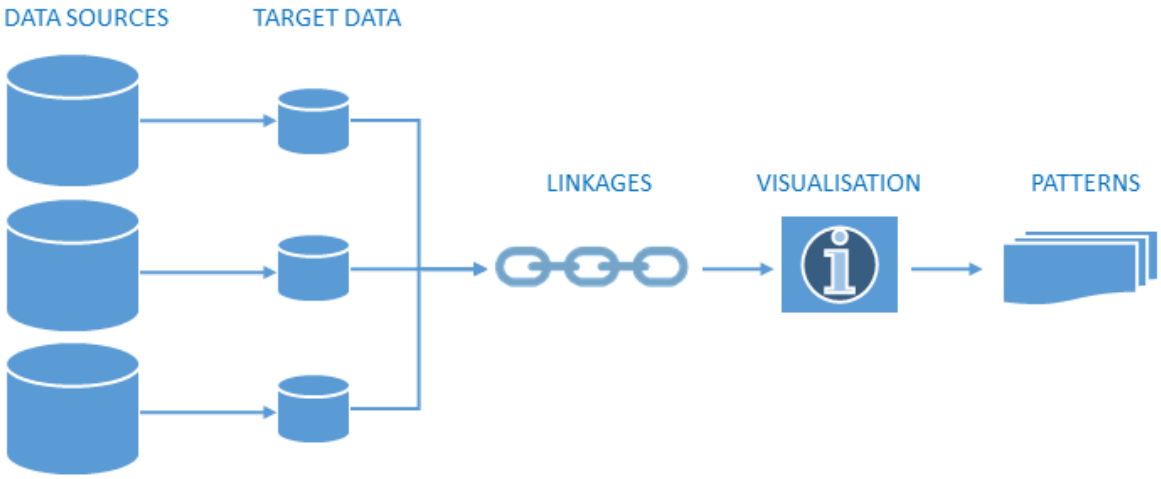


Figure 5. Knowledge discovery process (adapted from Bramer, 2013, p. 2)

Figure 5 shows the process of data mining in the case for this research. Different data sources are browsed for target information. This target information is linked mutually with the use of corresponding attributes. An example of such an attribute is a Social Security Number (BSN). In most cases, personal information that is stored in different places is based on this number. Combining different data sources can lead to clear perspectives on situations. A visualisation can have a positive effect on the discovering of patterns. Figure 5 slightly differs from other representations of the so called 'knowledge discovery process' or KDP (Bramer, 2013) which is the overall process and of which data mining is an element. It is the process of data that comes in from many sources, is integrated, pre-processed and finally data mined. Out of this data mining process, patterns derive and this will lead to new and useful knowledge. The process represented in figure 5 specifies the 'pre-processing' stage in linking the data on corresponding attributes. Discovering the patterns is placed at the end of the process because of the fact that these patterns often become visible or interpretable when they are visualised. The visualisation method (sub question 3) is dependent on the sort of data that are processed. A final step of this figure is missing for this research because as mentioned in the theoretical context, the abundance of data results in a lack of actionable insights (Pauwels et al., 2009). After visualising the data in a proper way, patterns can be discovered and this will result in acting upon these insights.

4.3.1 System of Key Registrations

Key registrations are an important source of data within municipalities. The key registrations in the Netherlands are developed to improve the services of governmental institutions and to work more efficient. These registrations operate on the principle of 'collected once, used many times'. In this way, the government does not have to approach citizens or companies every time they need information; it is already registered. There are 11 key registrations in the current system (Stelsel van Basisregistraties) and contain different kinds of data (see appendix 1 for all key registrations). These key registrations are linked mutually which gives the opportunity to exchange and combine different contents of the key registrations (van den Broek et al., 2014).

Municipalities are the source holders of five key registers: BGT, BRO, WOZ, BRP and the BAG. A source holder is responsible for collecting and updating the authentic and non-authentic information in a key

registration, as well as ensuring the quality of this information. The authentic information is mandatory to use for all institutions with a public function. The primary attributes, such as an identification or a house number (nummeraanduiding), are authentic. Administrative information, such as the start and end date of an attribute or the documentation date of a mutation, is covered by non-authentic information. The main difference between authentic and non-authentic information is the compulsory use (STIP, 2014). It is mandatory for a local government to use the information of the other key registrations. This obligation is one of the twelve requirements that exists for the key registrations (e-Overheid, 2014):

1 The registration is regulated by law
2 The users have to report errors in the registration to the suppliers, and the suppliers need to investigate this notification
3 It is mandatory for the entire government to use the key registrations
4 Clearness about the responsibility of a key registration
5 Reasonable prices for the realisation and exploitation
6 Clearness about the content of a key registration and clear definitions
7 Clear agreements between the source holder, supplier and purchaser of a key registration
8 The accessibility of public key registrations is clear
9 A strict regime for the quality of the key registrations
10 Purchasers can influence the decision-making process of a key registration
11 A clear position of the key registration within the system and the relationships are described
12 The government retains control over the key registrations

These twelve requirements show the importance of the key registrations for the government. The requirements are focused on guaranteeing the quality and availability of the data. Some key registrations, BAG and BRP, have an audit on their importance once every three years, which is a check on accuracy, quality and process. The responsible source holder has to pass this audit successfully. Updating the key registrations is therefore a serious task of the responsible organisation or source holder.

The key registrations were a fundamental element of the data requirements for this thesis. The key registration Buildings and Addresses (Basisregistratie Gebouwen en Adressen - BAG) for instance, was important to 'make things spatial'. Every property has an address, a status, a function, coordinates and so on. Another important key registration for this thesis was the key registration for Personal Records (Basisregistratie Personen – BRP – previously called GBA), which contains all personal records of inhabitants and non-inhabitants (a person who used to live in the Netherlands or has lived in the Netherlands for a shorter period of four months, and has a relationship with the Dutch government) of the Netherlands. Name, address, Social Security Number (SSN or BSN in Dutch), nationality and more personal information is registered. This SSN is an important attribute because all information that is related to an individual is registered using this number. Data within municipalities should be collected in accordance with these key registrations so that the data is unambiguous, correct and multiple-to-use. is used to make information and data spatial and representable on a map, and the BRP is used for personal information and to link information based on the Social Security Number or addresses. Because a municipality is obliged to use the key registrations and to use these as a starting point for other forms of information registration, linking healthcare data deriving from the Integrated Healthcare System (GWS application) with key registration data is possible.

4.3.2 Integrated Healthcare System

Since the municipality of Vught served as a case study for this research, the data that is processed is supplied by this municipality. This municipality uses the GWS (Geïntegreerd Welzijns Systeem or Integrated Healthcare System) application. This integrated healthcare system contains detailed personal information of clients with a healthcare indication within the municipality. The GWS application consists of several modules, for instance the Wmo module. This module contains detailed data with a number of attributes: name, address, postal code, start and end date of the facility, specifications of the facility, address of the healthcare institution and so on. These data can be retrieved using a SQL script can be transformed to an excel sheet.

There are a lot of separate data sets which contain different, but additional, information with corresponding attributes. Some of these data sets are directly delivered in an excel format, but need to be pre-processed before they can be used. Because the data sets contain personal information, privacy related issues arise. Personal data can be related to an identifiable person and should therefore be handled with care: "it should be collected for specified, explicit and legitimate purposes and not further processed in a way incompatible with those purposes" (Data Protection Directive as cited by Kulk and van Loenen, 2012). Linking and accessing different datasets are also important to mention because these rights varies per municipality. These issues were addressed during a regional meeting of local authorities named the Gemeentelijk Geo-beraad Oost-Brabant (10 maart 2015). This Geo-beraad is dedicated to address all kinds of issues concerning geo-information with which municipalities deal with. One of these issues was linking different data. Some municipalities have implemented their policy in such a way that they have more possibilities and rights to link and access all kinds of data. Other municipalities have severe restrictions for linking and accessing these data. With this, the remark has to be made that it depends on the information policy of a municipality to what extent is it possible to link different data.

It is important to mention that this data gathering is conducted by someone of the municipality of Vught. Because of their information policy and the privacy issues it is not allowed to give access to all data and it also requires knowledge of the application. This means that the definitions of the indicators and thus the required datasets and attributes have to be very clear, otherwise it is undoable for the one that retrieves the data out of the GWS application and could also lead to the supply of wrong data. The specific datasets and attributes that are used for the continuation for this research are the output of this sub question.

In the end, however, it seemed that there was not enough data available for the purpose of this research. The available data was more focused on providing overviews of the distribution of clients within Vught rather than fueling a dashboard. Therefore, it was decided to generate own data to have the ability to demonstrate the possibilities for a dashboard in the social sector.

4.4 Visualisation methods

The last step for this thesis was to test some visualisation forms for the final data. These visualisations were data-dependent which means that the type of visualisation could only be determined when the type of data is known. An issue that needed attention and had an influence on the final visualisation was privacy. Personal (healthcare) data is processed and it was important to bear in mind that this data should be visualised in such a way that it cannot be related to an identifiable person. From a geographic point of view this means that point data, based on 6-digit postal codes including house

numbers (e.g. on building level), is not allowed and needed further processing to anonymise the data. Using Kernel Density on district level can avoid these privacy issues. The processing of the data is done by using software such as ArcGIS for Desktop 10.2.2. This data should, however, be aggregated to one number or figure because of the use of a dashboard. The depth interviews with different municipalities and sessions focused on the subject of this research served as an input for the determination of visualisation types. What are common used visualisation types at municipalities that already use dashboards?

4.5 Schematic overview methodology

Figure 6 presents a schematic overview of the methodologies for this thesis and how these relate to the sub questions. Sub question 1 is answered by the theoretical background and is therefore not part of the model in figure 6. The second sub question is answered by the outcomes of in-depth interviews with various municipalities. Sub question 3 and 4 are executed by following the steps developed by Veleva and Ellenbecker (2001).

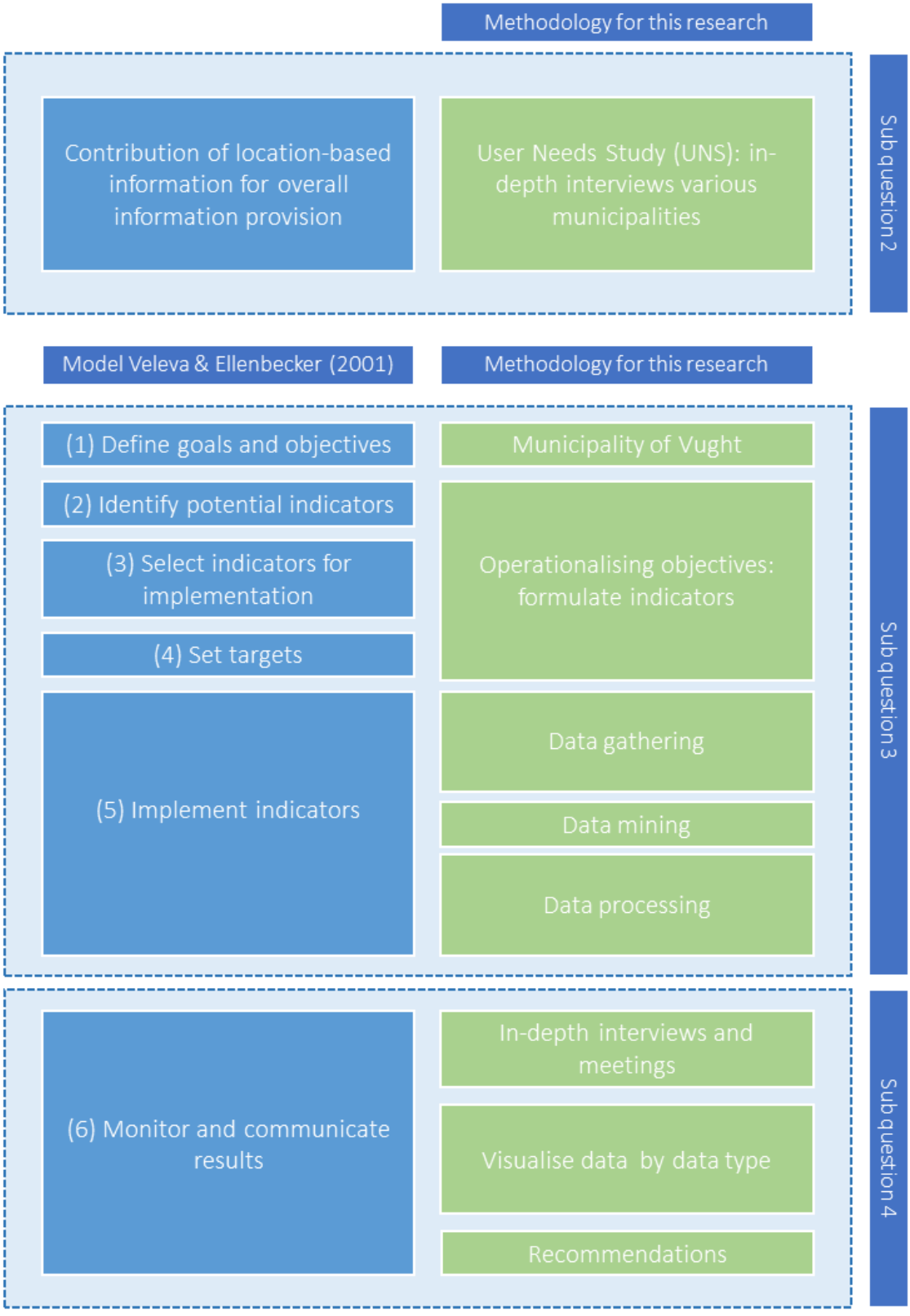


Figure 6. Schematic overview of methodology

5 The contribution of location-based information

This chapter will provide an answer to the second sub question:

In what sense can location-based information and data contribute to the overall information provision of municipalities with regards to the decentralisations in the social sector?

Some viewpoints of various municipalities on the contribution of location-based information and data to the information provision regarding the decentralisations are determined by the in-depth interviews. The starting points to integrate location-based information, data issues, (organisational) limitations, visualisation possibilities and the potential use of dashboards in the information provision were main topics during the in-depth interviews. These different topics and the presence of multiple representatives of different departments provided useful information. This section will elaborate the outcomes of the in-depth interviews regarding the different viewpoints and the difficulties that arose during this development of some implementation forms are also addressed. The best practices that emerged during the in-depth interviews conclude this chapter.

5.1 Viewpoints of representatives

District profiles

This aspect was raised by most municipalities. According to the representatives, profiles that cover the issues or the composition of the residents within municipal districts will have a positive influence on further policy implementation: “What is actually going on in a particular district and what type of healthcare requests are most common in this area?” (Gemeete Zaanstad, 2015). Information such as age, household composition the financial situation of the residents and the facilities presented on a map gives an impression of the issues that occur in that district. For instance, a district with a high number of residents older than 75 years and a poor financial situation deserves more attention in the case of healthcare than a district composed of young dual earners. Besides these individual characteristics, the municipality of Velsen stated that the involvement of crime rates could be helpful. This is also an indicator that requires attention in a district. Representatives indicated that a district profile of the municipality results in a targeted and more efficient approach. As the representative of the municipality of Zaanstad stated: “The aim is to have insight in the challenges within the different districts of our municipality in order to customise the approach”.

Mapping different target groups

The previous aspect already adduced an example of a possible target group of clients. Multiple factors can indicate a specific target group. Defining these factors is a difficult tasks and is mentioned several times by the representatives. Municipalities have their own way of defining these factors. For instance, the representative of the municipality of Zwolle gave the example of so-called ‘household profiles’: 14 profiles which each contain approximately hundred indicators, such as buying and online behaviour and the type of car. The municipality of Vught focuses more on requests for assistance (e.g. financial or healthcare related) as indicators for target groups. In line with this view, the municipality of Zaanstad investigates ‘expensive’ households that are currently eligible for multiple types of healthcare. Visualising these different target groups can result in a more targeted approach.

Location of facilities

A common aim across the municipalities is to organise the environment and housing in such a way that clients with a disability have the ability to (longer) pursue their lives at home. Locating basic facilities in their direct environment can positively influence this aim. An up-to-date overview of locations for daytime activities, support centres, community centres and sport facilities for instance could result in the allocation of clients with higher efficiency. Several municipalities have the aim to locate and organise healthcare facilities as close as possible to the clients, partly because of the savings on transport costs. Besides the locations of facilities, locating suitable (vacant) properties was a common topic across the municipalities. The representatives of the municipality of Tilburg stated: "We want to know the exact locations of facilities, adapted housing and future vacant properties within the municipality". Vacant properties can give room for adapted housing or new facilities. The municipality of Zwolle therefore involves housing corporations in the process of data gathering to cover this aspect.

Developments over time

Displaying developments over time are useful for measuring the effects of the implemented policy. Graphs as well as maps are useful for displaying developments. The in- and outflow of clients is a common indicator that municipalities want to monitor. The aim is to enlarge the number of outflowing clients. A representation of the outflow of clients over time will indicate whether the chosen approach to stimulate this has its desired effects or not. The representative of the municipality of Zaanstad stated that they use dashboards within the municipality for this reason: "We want to use dashboards to measure the effect of the approach we have chosen on district level. The generation of these effects or trends is currently hard because of recent transition of tasks and the lack of (enough) data, but will be possible on the short term". Developments over time can also be displayed geographically. The spatial distribution of target groups for instance can change over time.

Future projections

District profiles are not only useful for representing the current situation within a municipality, but also for making future projections. Some issues can be ascertained now and enable (preventive) actions if necessary. Future developments can be determined based on current district profiles. For instance, a district that contains a lot of residents with the age 60 or higher, it seems likely that within 5 or 10 years this part of the municipality needs some attention. The representatives indicated that such projections will be very helpful in the policy and decision making process. It should be stated that in the case of this example, residents can move to a different place. Future projections should therefore be handled with care when implementing policy based on these uncertainties.

5.2 Difficulties for the information provision

During the implementation of supportive systems for the information provision within the decentralisations, municipalities are facing some challenges and difficulties. The trends in difficulties are summarised in four main points.

- *Getting the right people together and motivate them*: the people working within the social sector are very busy to get things straight and done. Deliberations about the development of new supportive systems have a low priority. According to the representatives, it is hard to involve the right people in this process due to the current hectic times: "We as Information

and Statistics department want to help, but finding a moment to bring all actors together is a real challenge because of the busy times in the social sector" (municipality of Zwolle).

- *Formulating and defining the right key performance indicators*: it is a great difficulty to formulate the right indicators that can support policy and decision makers in their daily tasks. The representatives during the interviews often indicated that the current management teams are struggling to concretise their questions and what they want to monitor. Besides this, defining specific terms such as self-reliance or vulnerable groups brings some challenges. Which information is needed to get insight in the self-reliance of people? The Association of Dutch Municipalities (VNG) and Quality Institute Dutch Municipalities (KING) established 170 indicators concerning the decentralisations. An example of one of the 170 indicators is a district profile, the same as defined by the municipalities during the in-depth interviews. The operationalisation of this indicator consists of five characteristics: social environment, self-reliance, reliance along others, mental health and lifestyle. These are recurring terms in the decentralisation and seem very general. As a representative of the municipality of Zaanstad argued: "Some terms are unclear: when is someone self-reliant and *what* is self-reliance in the first place?". This underpins the difficulties in operationalising the objectives and indicators.
- *Getting the right data*: municipalities have to negotiate and cooperate with health insurers and healthcare providers to exchange data, however according to the representatives this a difficult process. Due to privacy reasons these health insurers and healthcare providers do not provide their registered data of clients and what sort of healthcare they receive. This leaves municipalities with an incomplete data provision which results in the inability to generate well-founded overviews, financial estimations and future projections. This is especially the case for Youth Care. In some cases when the data are available, they are in different formats, registered in different ways or incomplete which makes it time consuming to match these data to others.
- *Technical-driven solutions*: in most cases, the ideas for supportive systems within the decentralisations are technical driven. This results in a clash of the earlier mentioned technology push and demand pull. By focusing too much on the implementation of new technological supportive systems within the decentralisations, the main reason to implement such a system can be overlooked. From a technical point of view, the possibilities are infinite. However, the demands for such systems must be present in order to function as a supportive system.

5.3 Data issues and recommendations

Data issues were a common topic during the depth interviews with the municipalities and were also noticeable during the data gathering and processing phase of the thesis. Some of these issues are elaborated with more detail in this section.

5.3.1 Data issues

The scarce availability of data

This issue was mentioned in every interview by the representatives. As mentioned earlier, health insurers, healthcare providers and general practitioners are reluctant to share their information with municipalities due to privacy reasons. Information and data concerning Youth Care, Public Health

Service (GGD) and the mental healthcare organisation (GGZ) are mentioned several times as examples of institutions that are reluctant in information sharing. The lack of some data results in deficient overviews of clients, incomplete financial estimations and insufficient projections for instance. According to the representative of the municipality of Zaanstad, generating projections is difficult in the first place, because the data which is significant to generate such a projection is currently constructed.

Privacy

Privacy issues are not only an issue when it comes to data sharing, but also during the processing phase. Personal (healthcare) data needs to be handled with care because of the change to violate someone's privacy by combining, analysing and visualising these data. Combining personal healthcare data with other data could be useful in some cases, however it is against the law to use data for other purposes than for which they were collected (Kulk and van Loenen, 2012). As mentioned by a representative from the municipality of Zwolle: "In some cases, privacy issues stand in the way of innovations".

Inconsistent registration and storage

An inconsistent way of registration complicates matching data and makes the data less reliable. Besides this, the level and timeframe at which the data has been obtained occasionally differs. Some data are only available at regional or city level and for a period of four years which makes them unusable for further processing. The representatives of the municipality of Tilburg gave an example of the inconsistence in data storage due to three different systems that stored the same numbers. It was unclear which of these three systems was most up-to-date and reliable.

These three data issues were also present during the data gathering and processing phase of this research. The scarce availability of data was the most present data issue. The redefinition of some indicators was the result of the lack of significant data. The representatives for the municipality of Vught formulated several indicators within the decentralisation of Participation (e.g. the number of volunteers and the percentage of wage value per client), but the significant data to monitor these indicators were not available at that time. Besides the scarce availability of data, privacy issues and the laboriousness of the data complicate the data processing phase. Due to the privacy sensitive data stored in the GWS application, someone from the municipality of Vught gathered the data used for this thesis. Besides this, it was obliged to process the data on site.

5.3.2 Recommendations on data issues

Some recommendations on these data issues are addressed here.

- Raise the awareness of data importance across stakeholders: stake holders (e.g. health insurers, healthcare providers and general practitioners) should recognise the importance of data for municipalities during their implementation of the new tasks. Municipalities should indicate how some data are crucial in this implementation and that sharing data could be beneficial for the stake holders as well.
- Agreements on anonymising data before sharing: this should especially be the case for data deriving from institutions, insurers and general practitioners. If data are not traceable to an individual, this could positively influence the process of data sharing. However, it should be

questioned to what extent data can be anonymised in order to guarantee the usability for further processing.

- Agreements on the registration of data: a standardisation on the registration of data will result in uniform datasets that facilitate exchange and combinations. To prevent the existence of non-filled attributes and to guarantee the availability of crucial data, some attributes should be obliged to register.
- One data warehouse: data is often stored in different applications and locations, and is owned by different institutions. This is inconvenient when working with dashboards. A data warehouse, which is a repository of data collected from multiple sources and provide analytics and reports of up-to-date and historic data (Han et al., 2012), would be a suitable solution to tackle the fragmented storage of data.

5.4 Best practices

Municipalities are searching for supportive ways to implement the decentralisation tasks. The digital information provision has changed because of the new tasks and has become more complicated than ever (Blankena, 2015). Living Labs and numerous sessions about the information provision within the decentralisations have the aim to provide municipalities with 'best and worst case scenarios' of supportive information systems. The Living Labs for the Information Provision Social Sector (VISD) are experimental environments that allow municipalities to investigate requirements within the information provision of the social sector, develop prototypes and serve as best practises (VISD, 2015). Five municipalities are pointed as Living Labs: Eindhoven, Enschede, Leeuwarden, Utrecht and Zaanstad. The municipalities Eindhoven and Zaanstad are approached for this research. Eindhoven is currently working on a pilot for a Social Domain dashboard and is in testing phase. It is a dashboard in a Cognos environment which retrieves information and data out of different data sources to generate management reports and represents these data in visual forms, also maps because of the Esri Plugin within Cognos. Maps are part of the dashboard environment because according to one of the representatives, maps are much more meaningful than circle diagrams for instance, which were used in the first case. The pilot is currently testing the added value of maps for the 170 indicators that are established by VNG and KING. Where does the use of 'location' adds value for monitoring the indicators? However, the difficulty of this testing phase is the abundance of indicators and the unclear definitions of terms within these indicators. Prioritising the indicators by the final users (the Executive Board, the Council, the heads of different departments, district teams etc.) is therefore essentially in this phase of the pilot and provides more grip on the essential indicators that demand monitoring.

The municipality of Tilburg uses the same sort of Cognos implementation as in Eindhoven. This municipality has started with the implementation of the minimum requirements that will provide insight: school drop-outs, adequate finances, in- and outflow and self-reliance. The aim is to visualise these data on district level, which can contain approximately 10.000 residents. Tilburg already uses dashboards for other purposes and want to apply the same method for the decentralisations in the social sector. Objectives will be formulated and supported by indicators that are visualised by different gauges. In contrast to the representative of Eindhoven, the representatives in Tilburg *do* appreciate the use of circle diagrams. Representing outcomes per district with a circle diagram or presenting these circle diagrams on a map is, according to the representatives of Tilburg, of added value. This emphasises the differences in preferences concerning visualisations that provide insight.

Zaanstad with their so-called Factlab was also adduced as an example of the practices with dashboard in the Netherlands in the Theoretical Background. It was stated that this Factlab was just based on facts without proper visualisations to represent these facts. However, the in-depth interview with this municipality clarified that this Factlab serves, among other data sources, as an input for an already operational dashboard. Different graphs and figures provide several target groups with information on district level about cases within these districts. The fact that this dashboard is already operational shows that this municipality is progressive in comparison to the other approached municipalities. The explanation for this is that the municipality of Zaanstad already started in 2014 by implementing the new tasks in the social sector. With this, the municipality has already gathered experiences and data that are now available for use. In contrast to most of the approached municipalities, the representative of Zaanstad does not completely shares the same viewpoint concerning the lacking data issues. He believes that there is enough data available now to generate the necessary overviews of clients and to make some estimations. More data are probably needed in a later stadium of the decentralisations, but "lets first picture the data that are available now and start from there". Besides, when some data are currently needed and not available, the municipality of Zaanstad is taking steps to gather this data themselves by registering the outcomes of conversations between a counsellor and client.

5.5 Conclusion

This chapter elaborated the outcomes of the in-depth interviews with various municipalities. The main aim of these interviews was to highlight different viewpoints on the contribution of location-based information within the information provision regarding the decentralisations. The second sub question was: *In what sense can location-based information and data contribute to the overall information provision of municipalities with regards to the decentralisations in the social sector?* In general, municipalities share the same viewpoints on the contribution of location-based information. Locating target groups, facilities and certain issues within districts to customise policy was mentioned several times. According to the representatives the first step is to gain insight in the current situation. When this step is completed, more analytical approached can be implemented. For instance, to geographically visualise changes over time to measure effects of implemented policy. Making future projections is another example of a more analytical approach and could be supportive for the customisation of policy. Currently there are some data difficulties that complicate the improvement of the information provision for the decentralisations. Inconsistent data registration and storage, scarce availability of data and privacy issues need to be tackled in order to create a solid information provision.

6 Objectives and indicators: a case study

From this point forward, the focus is on the case study: the municipality of Vught. The third sub question will therefore be answered based on the findings resulting from this case study.

Which indicators correspond to the formulated objectives with regards to the decentralisations and in what sense can location-based information add value for monitoring these objectives?

The first part of this chapter elaborates the objectives formulated by the case study for the new Wmo within the decentralisations. The second part is dominated by the operationalisation of the objectives. Corresponding indicators are formulated and it will be discussed in what sense location-based information could contribute to monitor these indicators.

6.1 Objectives

For this thesis, the emphasis was on the decentralisation of the AWBZ and the new Wmo because the representatives of the municipality of Vught indicated that the need for more clarity was mostly situated in this part of the decentralisations. The overall slogan concerning the support within the Wmo is "As close as possible, as simple as possible". The so called "Beleidsplan Wmo 2015-2016" formulates objectives related to the Wmo for the Meierij region and the municipality of Vught is part of this region. In addition to these objectives, some objectives are formulated by the representatives of the municipality of Vught. The combined objectives are (Beleidsplan Wmo, 2014, p. 11):

1. Clients with a disability have the ability to pursue their lives at home: increase the self-reliance of clients.
2. Clients with disabilities participate in the society according to their ability.
3. Clients with disabilities are satisfied with the support and healthcare they receive.
4. A shift from specialised healthcare towards informal or basic care.
5. Locate and organise (health)care and support as close as possible to the (health)care needing clients.

Referring back to the methodology discussed in chapter 4, the first step of the model is now completed: the objectives and goals are formulated. The next step is to operationalise the objectives by identifying and selecting potential indicators and setting targets for these indicators. However, this was associated with some difficulties. As mentioned before in the theoretical context, Key Performance Indicators (KPIs) are used for measuring the objectives when it comes to dashboards. A repetition of the quote made by Barone et al. (2011, p. 82): "A KPI is a term for a measure or metric that evaluates performances with respect to some objective". Veleva and Ellenbecker (2001, p. 522) state that there should be a clear distinction between goals or issues and indicators. They give the example of "safety", which is an issue and not an indicator. An indicator that would fit this safety issue is for instance the "number of accidents". With this, the issue or goal gets a unit of measurement (metrics such as numbers) which is one of the four key indicator dimensions according to Veleva and Ellenbecker. The other three are (1) absolute or adjusted type of measurement, (2) period of measurement and (3) a boundary that sets how far a company wants to go in measuring an indicator (Veleva and Ellenbecker, 2001, p. 522).

Going back to the objectives formulated in the Wmo Beleidsplan, there were some difficulties during the completion of the next steps of the model. The operationalisation of the objectives was difficult

because of the lack of corresponding indicators and targets that allow monitoring. Take the example of the aim to detect a shift from specialised healthcare towards informal care. This needs a definition of specialised healthcare and informal care. What forms of healthcare are specialised or informal? This sort of operationalisations where not thought trough by the municipality of Vught. Regardless of this, it is decided to operationalise the objectives for this thesis to demonstrate the possibilities for this process.

6.2 Operationalisation of the objectives

This section is focused on the operationalisation of the objectives formulated in the previous paragraph. This operationalisation involves the identification of potential indicators that measure the performances of the objectives. The potential of location-based information for some of the objectives is also addressed.

Clients with a disability have the ability to pursue their lives at home: retain and increase the self-reliance of clients

This objective requires a definition of 'self-reliance'. The degree of self-reliance of clients can be determined by using the self-reliance matrix (ZRM, 2013) during conversation between the client and the counsellor. The determination of the self-reliance degree is based on 11 different domains such as finances, day-time activities, housing, mental and physical health, addictions, social environment and so on. Five levels of self-reliance are defined: (1) urgent issue, (2) not self-reliant, (3) limited self-reliance, (4) sufficiently self-reliant and (5) completely self-reliant. Based on the outcome of the matrix the sort of support and intensity can be determined in order to increase the self-reliance of clients. Forms of support to increase the self-reliance of clients can be domestic help, financial and administrative help, physical help, informal care or housing modifications. For instance, a client who is immobile might be in need for domestic help or a wheelchair or stair lift. This enables the client to pursue its life at home.

A location-component could be of added value for this objective in the sense that it can support the allocation of (healthcare) facilities or clients in relation to modified properties. As mentioned in paragraph 3.7, according to Bregt et al. (2014) the main opportunity for the combination of location-based information and healthcare is the spatial optimisation of supply and demand for healthcare, to generate suitable and less expensive healthcare. In the case for this objective, a combined geographic visualisation of the locations of different demands for support (e.g. domestic help or a stair lift) and the current location of (healthcare) facilities gives insight in the geographic situation. The status of a property concerning modification possibilities can be of added value. A geographic overview of already suitable properties or properties that are suitable for modifications, including vacant ones, can be supportive to smarter allocate immobile clients. It is necessary to mention that the willingness of clients to move to a different house at a different location can differ per client: some clients will be more willing to move than others. This should be taken into account when using this approach.

To monitor if the self-reliance of clients does increase, the determination of the degree of self-reliance should be taking place every six months for instance. Does the self-reliance of clients increase because of the adopted approach? Based on the described approach, five indicators are formulated that can measure whether the objective is achieved or not.

Indicator 1: Self-reliance of clients based on the ZRM per quarter

Indicator 2: Location of clients with multiple indications: guidance, wheelchair provision, domestic help, debt counselling and benefits.
Indicator 3: Location of basic facilities (healthcare institutions, supermarket, ATM machine)
Indicator 4: Location of modified properties (stair lift, door expansion, alarm system)
Indicator 5: Location of properties suitable for modifications
Indicator 6: Location of (suitable) vacant properties

Clients participate in the society according to their ability

The Participation act is focused on helping clients finding a meaningful daily task. This could be interpreted as day time activities, such as for the Wmo, or a real job. The degree of self-reliance is of importance for this objective. Based on the classification from 1 (urgent issue) to 5 (completely self-reliant) it can partly be determined to what extent a client is participating on the right level. This objective is closely related to the aim of increasing the self-reliance of clients: participate in and rely as much as possible on the social environment. It is however difficult to measure this objective. What different forms of participation does a municipality distinguish? Besides this, measuring 'after their ability' is a quite general and vast concept.

Indicator 7: Number of clients within the Participation act and their degree of self-reliance (ZRM)
Indicator 8: Number of clients active in sheltered workplaces
Indicator 9: Location of sheltered workplaces

Clients are satisfied with the support and healthcare they receive

Measuring the satisfaction across clients is a legal obligation in the new regulations of the Wmo. Municipalities are obligated to annually justify results of a satisfaction survey across clients towards the higher governments (Beleidsplan Wmo, 2014). Based on these survey outcomes, a municipality could estimate whether clients are satisfied with the services of the municipality or not. For directing the degree of satisfaction of clients, it is of interest to determine the main reason behind the outcome. For instance, does location has an influence on the final evaluation of the services? It could be the case that the quality of the received healthcare complies for the client, but a long distance between the service and the client reduces this satisfaction. Determining the main reason(s) behind the outcomes of the surveys can support a municipality with choosing a suitable approach.

Measuring the degree of satisfaction across clients can be difficult. Getting sufficient input from clients to draw firm conclusions is a challenge. It is likely that not every client will participate the survey. The higher government is developing a method to measure the satisfaction across clients which makes it questionable if this survey is profound enough to monitor it on municipal level.

Three possible indicators are developed for the measurement of this objective.

Indicator 10: Percentage of satisfied clients according to a satisfaction survey
Indicator 11: Percentage of unsatisfied clients according to a satisfaction survey
Indicator 12: Main reason(s) for satisfaction or un-satisfaction

A shift from specialised (health)care towards informal or basic care

This objectives corresponds to the overall slogan of the municipality of Vught concerning the Wmo decentralisations: "As close as possible, as simple as possible". The municipality has the aim to enlarge

customised care and to reduce the use of specialised healthcare where possible. The representatives of the municipality of Eindhoven share this objective: "This shift will be beneficial for the overall budget. Generalising clients and providing the same form and amount of care is no longer the right approach. In some cases, clients with the same indication do not need the same amount or intensity of care. We have to focus on individuals instead of groups which can result in a reduction of costs". The municipality of Vught wants to monitor if clients use their social environment or informal carers in an increasing level. Based on reports from specialised (e.g. domestic help, transport facilities, property modifications, personal guidance, sheltered accommodations and addiction care) and basic (e.g. social work, primary psychological help, client support, preventive healthcare) healthcare providers, respectively a decrease and increase of requests should be identified.

Location-based information can support the municipality in determining the right form and amount of healthcare by geographically visualising a combination of factors: the self-reliance of every client, the form of healthcare they receive (specialised or basic), the location of civil initiatives (if there are any) or the social cohesion within districts. Clients who have a ZRM of 4 or 5 (sufficiently self-reliant or completely self-reliant) can possibly rely on their direct social environment in the form of civil initiatives (e.g. transport, domestic or administration help, meal services and chores in and around house). The indicators for this objective are therefore:

Indicator 13: Location and number of clients with a Wmo indication and their degree of self-reliance (ZRM)
Indicator 14: Number of requests concerning specialised (health)care
Indicator 15: Number of requests concerning basic support
Indicator 16: Social cohesion within districts
Indicator 17: Location and type of civil initiatives

Locate and organise (health)care and support as close as possible to the (health)care needing clients

This objective is a typical location-allocation problem and responds to the slogan. Healthcare facilities should be located as close as possible to the demands points (clients). The operationalisation of this objective is already geographically embedded and is therefore quite simple. The locations of clients with a Wmo indication concerning personal guidance (also clients from the Youth Care act) including the healthcare facility these clients already use and the locations of the facilities that offer personal guidance are needed. An optimisation of this situation is possible when these factors are comprehensible.

Indicator 18: Location and number of clients with personal guidance concerning the Wmo including the healthcare institution in use
Indicator 19: Location of facilities organising/offering personal guidance and support
Indicator 20: Distance towards basic facilities
Indicator 21: Location of (suitable) vacant properties for support centres
Indicator 22: Location of public transport stops

6.3 Indicators for implementation

According to the model of Veleva and Ellenbecker (2001), the step after the definition of potential indicators is to select indicators for further implementation. This selection should best-represent the objectives and finally enables measuring the overall performances. For the case study, it is decided to

select indicators that cover the slogan of the municipality of Vught: “As close as possible, as simple as possible”. It is the aim to lower the number of specialised healthcare indications where possible and to increase the self-reliance of clients. This means that the clients should rely on their social environment, informal carers and volunteers. The approach is mentioned several times in the Beleidsplan Wmo and during meetings with the representatives of Vught reflects the importance of this approach and has therefore been used as starting point for demonstrating the possibilities of a dashboard.

Two objectives formulated by the municipality of Vught cover the approach of offering more basis (health)care close to the clients:

- A shift from specialised healthcare towards informal or basic care
- Locate and organise (health)care and support as close as possible to the (health)care needing clients

These two objectives are operationalised into ten potential indicators. However, some indicators that are part of other objectives or not mentioned for the objectives above can be of interest for the chosen approach. For instance, the self-reliance of clients and the expenses on different types of indications provide useful information for the approach. As mentioned before by Richardson (2009) in the Theoretical background, a principal of dashboard design is to use no more than seven indicators on a dashboard because of the risk of an information overload. Therefore, the indicators are prioritised and merged where possible. The final indicators that are selected for further implementation are:

1. *Number of clients per type of regulation*: this indicator is of importance to gain insight in the ratio of different regulations. When aiming to establish a shift from specialised (health)care towards more basic forms of care, such as informal carers or civil initiatives, it is of importance to acknowledge the division of amounts between specialised and basic forms.
2. *Costs per type of regulation of the total budget*: the major cutbacks leaves municipalities with a challenge and makes it even more important to operate with great efficiency. An indicator that provides financial information about the division of costs per regulation is therefore integrated as an indicator on the dashboard.
3. *Relation between specialised and informal care and the corresponding demand and supply*: this will instantly show the division between the demands for specialised care or basic care. How many clients request for a special form of support? In the end, it is the aim to lower the number of requests concerning special care.
4. *The self-reliance of clients per type of regulation*: the average self-reliance of a specific group of clients gives an estimation of which of the 11 different domains, such as finances, physical and mental health, needs attention for this group.
5. *Concentrations of clients and their location with respect to basic facilities*: this indicator covers the aim to locate and organise (health) care and support as close as possible to the clients. A visualisation of the local distribution of clients and the basic facilities, such as healthcare institutions, supermarkets and ATM machines, presents the situation and if the aim is being met or not.
6. *Travel time towards basic facilities*: this indicator gives an estimation of the accessibility of basic facilities to clients. How many clients have to travel more than 10 minutes to go to the

supermarket? A large number is undesirable. This indicator can be interpreted in many ways. For instance, the type of transport: by foot, by bike, by car or by public transport. All these types of transport will have a different average travel time. It is the municipalities tasks to determine which of these transportation types is of most interest. The type of facility from which the average travel time is measured can also influence the outcome. Clients will be more willing to travel for a longer period of time towards a hospital then traveling towards the supermarket.

7. *Score on social cohesion*: the social cohesion within a municipality or district can say something about the willingness of the social environment to support the ones in need. Clients living within a district with a high score on social cohesion are more likely to rely on their social environment then clients living within a district with a low score.

6.4 Conclusion

The third sub question was the central question for this chapter: *Which indicators correspond to the formulated objectives with regards to the decentralisations and in what sense can location-based information add value for monitoring these objectives?* The operationalisation of the indicators was a difficult process partly due to the fact that the municipality of Vught still was in process on deciding the appropriate way of this operationalisation. The willingness for this research of the representatives within the decentralisations of Vught was definitely present, however, the time was the sore point. Starting with the new responsibilities from January 2015, this research had a low priority which is understandable. However, the formulated objectives in the Beleidsplan Wmo and the several meetings with the representatives resulted in a background to continue the research. It was decided to lean on the overall aim of the Wmo of the municipality of Vught: “As close as possible, as simple as possible”. In the end, seven indicators are selected that cover this aim. These will be implemented for the final dashboard, which is elaborated in the next chapter.

7 Visualisation of the indicators

This chapter will give an answer on the fourth and last sub question:

What types of visualisations can represent the indicators and what features can support monitoring the objectives within a dashboard environment?

The input data for the visualisations is the first part of this chapter. It is elaborated that the data is fictive and why it is chosen to generate own data. The second part covers the seven different visualisation types that form the final dashboard. The features that should be integrated in the final dashboard are elaborated in the third paragraph of this chapter.

7.1 Input for the visualisations: fictive data

As shortly stated in the Methodology, the lack of suitable data for fuelling a dashboard resulted in the generation of own data. There was uncertainty about the availability of data: is it registered and if so, where is it stored? The missing formulation of indicators and measuring methods for the objectives formulated by the municipality, the lack of actual data and time constraints where the underlying reasons for generating fictive data. The focus of this research was on demonstrating the possibilities for a dashboard environment with location-based information regarding the decentralisations within the social sector. The focus was not to investigate the availability of data, even though it was a topic during the interviews, and the data sources that are needed to fuel a dashboard. After determining that the availability and current data structure was complex and not equipped for the purpose of this research, it was decided to generate own data based on some estimations in the Beleidsplan Wmo.

The advantage of this is that there are no restrictions concerning possibilities for the dashboard due to data unavailability and privacy issues are circumvented. A disadvantage of generating own data is the difficulty of making it realistic in terms of amounts and combinations. The lack of knowledge of the data registration and the amounts of clients in the social sector results in a own interpretation and estimation of these data. Besides this, the combination of data, such as the different types of regulations, are to some extend based on own interpretations. During meetings with the representatives of Vught, the localisation of vulnerable residents within the municipality was mentioned several time. The definition of these vulnerable residents by the representatives was mainly focused on economic aspects: benefits, debt counselling, remission requests and so on. Considering the overall aim of localising more basis care close to the clients, this definition does not reflect this aim. The aim is focused on clients who have limitations in mobility to increase their self-reliance. It is therefore decided to adjust the definition of vulnerable residents by focussing on clients with domestic help, personal guidance and regulations concerning wheelchairs, transport or housing.

7.2 Visualisation types and features of the dashboard

This paragraph focuses on the translation of the indicators into visualisations for the dashboard environment. A definition given by Few (2006, p. 34) emphasises the visual aspect of dashboards: “a dashboard is a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so that the information can be monitored at a glance”. This was the starting point for the final dashboard that represents the selected indicators for the municipality of Vught (see appendix 9 for the dashboard). Seven visualisations represent the selected indicators in a simple way. In the Theoretical background different visualisation techniques are adduced defined by Keim et al. (2003) and Liu et al. (2014). Graph visualisations (e.g. bar charts,

histograms and line graphs), text visualisations, map visualisations and multivariate data visualisations are distinguished by these authors. Besides visualisation techniques, interaction techniques are mentioned by these authors. These techniques can be used to let the user interact with the data by selecting, filtering, highlighting and navigating through the data. This paragraph elaborates the seven visualisations that represent the indicators in the context of the aim of localising and organising (more) basic forms of help close to the clients, and what features the dashboard should have when implementing this in real-life. The final dashboard is presented in Dutch because it is developed for use within the municipality and English would not be of interest for this purpose.

7.2.1 Translation of indicators into visualisations

Indicator 1: Number of clients per type of regulation

This stacked column chart shows the number of clients per type of regulation (figure 7). Five regulations are distinguished: domestic help, personal guidance and regulations concerning wheelchairs, transport or housing. As mentioned earlier, these clients are considered as the target groups for the overall aim. A stacked column chart is chosen for the representation of the amount of clients with different regulations, because it gives information about the division between the different regulations and how this division develops over time at a glance. Every column presents a quarter of a year (entire 2014 and half 2015). The columns vary in size in order to represent the differences in total amounts of clients per quarter. The higher the column, the more clients in that period. In order to emphasise the fluctuation between the columns, series line are added. The number of clients per regulation are added for more detail. This stacked column graph is a suitable visualisation technique when dealing with different variables in time, without overwhelming the user with too much information. A clustered column graph, where every quarter will consist out of 5 different columns for this case, would have a greater risk of an information overload.

A small downsize of this visualisation is the remarking middle section that draws attention. In this case, the major part of all clients receive domestic help. The other types of regulations with a smaller number of clients slightly disappear and seem less important.

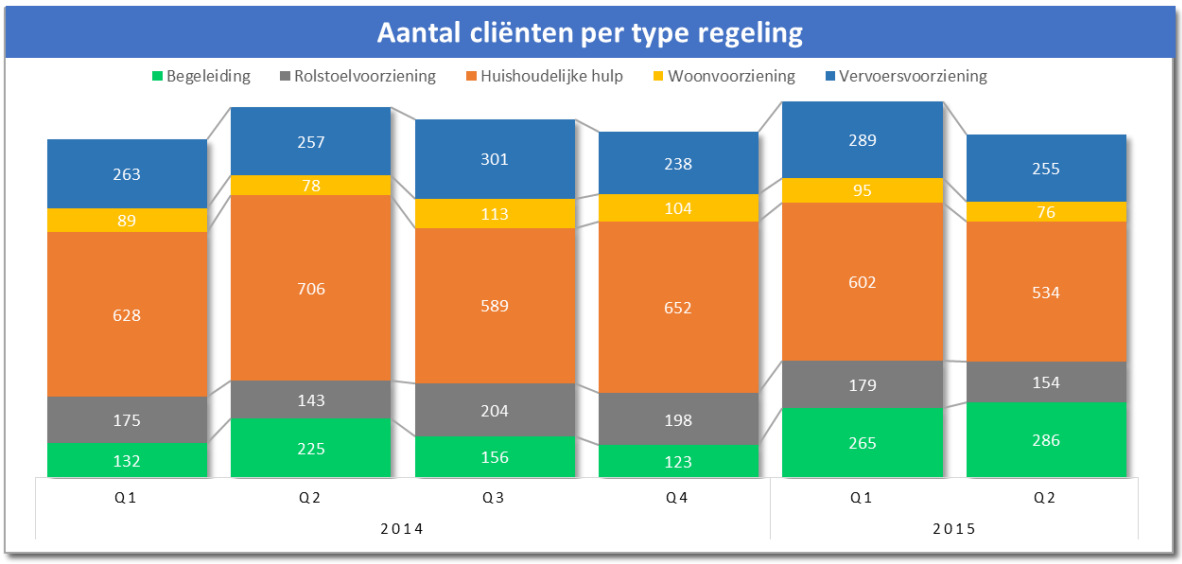
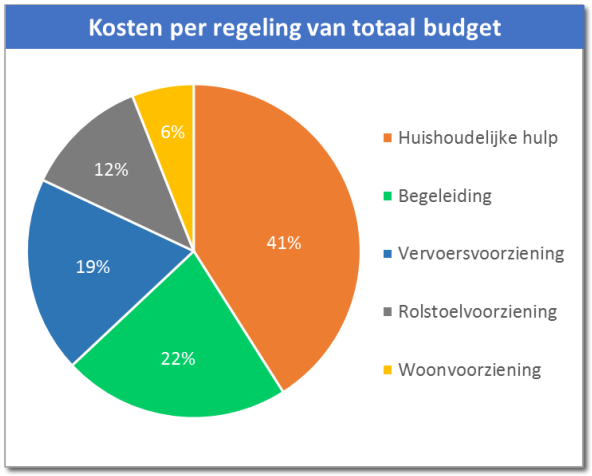


Figure 7. Number of clients per type of regulation

Indicator 2: Costs per type of regulation of the total budget

Next to the number of clients per regulation, the corresponding part of the total budget is represented in a circle diagram (figure 8A). The same colours are chosen to guarantee consistency and recognition. As mentioned by Richardson (2009), caution is needed when using circle diagrams in a dashboard environment, because of the difficulty in comparison. This was also ascertained during the interviews. Some representatives stated that circle diagrams are meaningless while others find them really useful. A circle diagram can indeed be useful when it is visualised in a proper way and with no more than six segments, according to Richardson (2009), to keep it organised. For the case of this indicator, a circle diagram is suitable. It represents the proportions of expenses of the overall budget based on different regulation types and gives an indication of the division of costs. The visualisation should be implemented in such a way that it varies in size to indicate the total costs: the bigger the overall circle, the higher the total costs. It is obvious that domestic help is the largest item of expense, followed by personal guidance and transport regulations. Making a circle diagram easy interpretable starts with the sequence of segments. The segments should be places on descending order, clockwise. Arranging the segments without this logic makes it hard to interpret. Adding the percentages gives the end user more detail about the actual proportions.



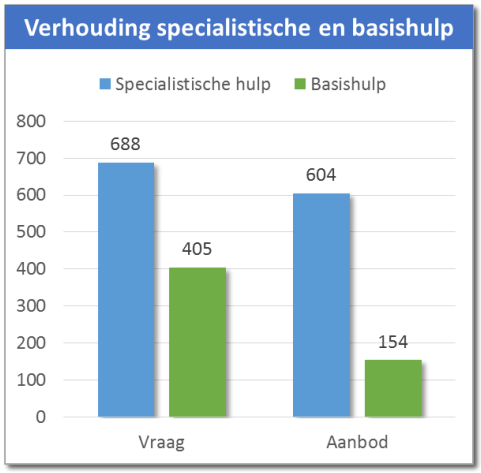


Figure 8. A. Costs per type of regulation of the total budget B. Relation between specialised and basic care

Indicator 3: Relation between specialised and informal care and the corresponding demand and supply

The aim is to determine a shift from specialised (health)care towards informal or basic forms of care. This asks for a visualisation that represents the division of the two forms of care. Is the number of clients within specialised forms of care still higher than the number of clients within basic forms of care? This indicates that the aim is not (yet) achieved. There should at least be a balance between the two. A histogram is a suitable visualisation technique for this purpose (see figure 8B). The columns give an instant impression of the situation: the demand for specialised care is higher than the demand for basic care. Besides this, the supply of specialised care is also much higher than for basic care. This indicates that something needs to change. Increasing the supply of basic care can in some way enlarge the use of these forms of care. All four columns should be on one line to some extent.

Indicator 4: Self-reliance of clients per type of regulation

This indicator represent the average self-reliance of clients per regulation based on a combination of the self-reliance matrix (ZRM, 2013) and radar (ZelfredzaamheidsRadar, 2015). These two differ in the

sense that they use different definitions of living domains. The self-reliance matrix distinguishes 11 domains: finances, day time activities, housing, family relationships, mental and physical health, addiction, everyday life abilities, social network, social participation and justice. The self-reliance radar distinguishes 15 domains which are more detailed and focus on the little things, such as body temperature. Some of these domains seem irrelevant for determining the overall self-reliance of a client. However, the visualisation and usefulness of the radar is more evident than the matrix. Therefore, it is chosen to combine the two for the final visualisation on the dashboard. The 11 domains of the matrix are combined with the visualisation principle of the radar (see figure 9). As mentioned in the operationalisation chapter, the scale ranges from 1 to 5 where a 1 indicates an urgent issue and 5 stands for complete self-reliance. One of the objectives was to increase the self-reliance of clients. This means that the line should move to the outer circle. An erratic line indicates that there are some domains with a low score.

The self-reliance radar visualises the average self-reliance of clients with a specific regulation. This means that there are five different radars. The line that represents the scores on the 11 different domains have the same colour as used for distinguishing the types of regulations in the first two visualisations to create consistency. For the case of figure 9, the average self-reliance of the group of clients receiving personal guidance is presented. In a real dashboard environment, changing the group of regulations presented in the radar should be possible by clicking on the visualisation or by scrolling with the mouse wheel. It is chosen to represent the self-reliance per group of clients instead of representing it for the entire municipality or per district. The generalisation will result in non-information; it does not mean anything to put everyone under the same umbrella.

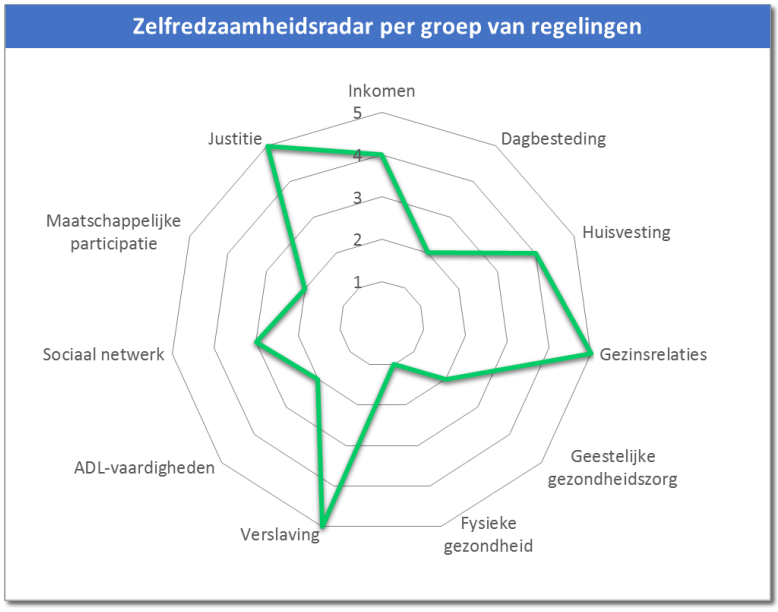


Figure 9. Self-reliance radar per group of regulations

Indicator 5: Concentrations of clients and their location with respect to basic facilities

This indicator is focused on the aim to localise and organise (health)care as close as possible towards the clients. The most suitable way to visualise this is by using a map. As Lechner and Fruhling (2014, p. 57) state: “A map provides situational awareness”. Using maps is a way to place situations in their context and make them ‘real’. Maps offer insight at a glance and gives the user the ability to search for

patterns. For these reasons, a map is integrated in the final dashboard (see figure 10). It represents the concentration of clients concerning the five regulations: domestic help, personal guidance wheelchairs, transport or housing. It is noteworthy to refer back to the fact that this client data is fictive and does not presents the actual situation. The data is generated by creating a number of random points based on the key registration Basisregistraties Adressen en Gebouwen (BAG) with ArcGIS 10.2.2. To circumvent the privacy issues that arise when processing actual data, the density of the number of clients can be calculated. Besides that a density calculation circumvents the privacy issues, it is also a way to make the map easier to interpret. A smooth surface with gradient colours is much easier than looking at concentrations of points. ArcGIS 10.2.2. offers two methods for this calculation: Point Density and Kernel Density. Both outcomes are raster based. The Point Density method sums up the number of points within a search area which is then divided by the search area size. This results in a density value for each cell. The Kernel Density method is more complex. From each point location, the quantity of the population for each point is spread out. By a quadratic formula the surrounding surface of each point is calculated and results in a smooth surface with the highest values at the centre of the point locations and lower values for the distance of the search radius (ArcGIS Resources, 2014). For the map in the dashboard environment, the Kernel Density method is used. This because it results in a smoot surface without indicating the actual location of points. The Point Density results in a surface that is more focused on the actual location of the points because of the construction of the search radius which can be tricky when dealing with privacy related data. The Kernel Density method smooths the surface in a more suitable way for this purpose.

It is noteworthy to remark that some caution is needed with the interpretation of the results. It is not necessarily the case that a darker coloured area contains a higher number of points. It should be interpreted in the sense that a darker coloured cell has more points around them than lighter coloured cells (ArcGIS Resources, 2013). Another issue arises because the density tools work with a certain demarcation of areas. In the Theoretical background, the modifiable areal unit problem (MAUP) is already addressed. This concept illustrates the problem of the generation of different results during analysing aggregated data, while the same analysis is applied, but with different aggregation schemes. In the case for this analysis, the zoning problem comes into play. This is the problem that occurs when the shape of the aggregation units is different but with a fixed scale of analysis. The same data is being analysed, but with different demarcations of areas which results in different outcomes (see figure 3). For the map of the concentration of clients, a demarcation of the different district within Vught is used. Vught consists out of 17 different districts but these districts are part of three larger areas. Using the latter demarcation will give a totally different outcome.

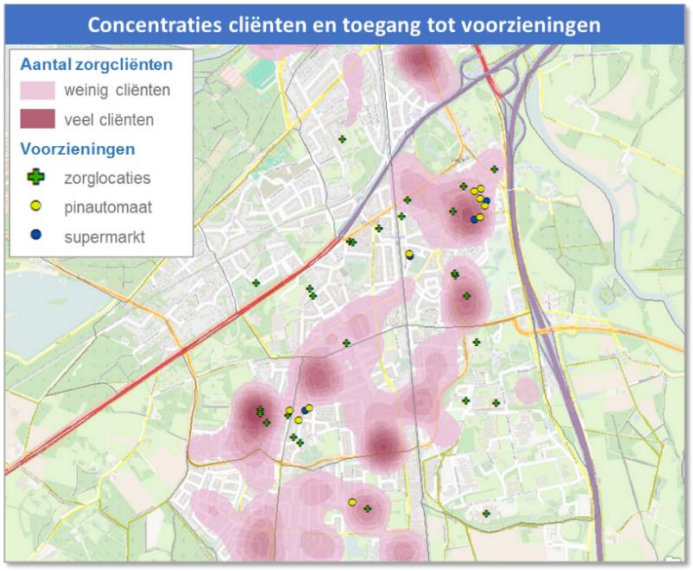


Figure 10. Concentrations of clients and basic facilities

The map and legend is purposely simple because it is part of a dashboard environment. A dashboard should be simple and easy interpretable. There is no need to include the complete colour scheme with values in the legend for the concentrations of the clients. Users will automatically understand that a dark colour indicates a higher value. The purple colour is chosen because it is an independent colour with no associations such as red or green.

Indicator 6: Travel time towards basic facilities

This is a very simple visualisation because it is just one value that is represented (see figure 11A). However, it gives an instant impression of the division of clients with a travel time of 10 minutes or shorter. It is chosen to use travel time instead of an average distance, because of the misinterpretations an average distance could have. For instance, the distance towards a supermarket could be 2,5 kilometres as the crow flies, while it is 4,3 kilometres on the road. Using travel time does have a downside because it should be determined in what way a client travels: by foot, by bike, by car and so on. On the other hand, this does not matter for the final outcome because is not important *how* clients get to their destination, it is the travel time that is of interest. This measurement is therefore purely based on the travel time from start to end, regardless of the type of transport.

The green thumb is used to support the rapid information consumption. It instantly gives the impression that this indicator is doing good at that time. It is up to the municipality to decide the border between a red and a green thumb.

Figure 11. A. Travel time towards basic facilities B. Score on social cohesion

Indicator 7: Score on social cohesion

The social cohesion within a municipality or within districts can give an indication of the willingness of residents to help others in their direct environment. Surveys on social cohesion often focuses on how residents of a district experience their living environment and to what extent these residents are connected with the district. The aim of these surveys is to determine if residents meet each other, the safety within the district, the amount of contact between neighbours and so on. The score on social cohesion is important to integrate in this dashboard because it gives an idea of the possibilities for clients to rely on their social environment. A high score is more likely to offer perspectives in this case than a low score.

The visualisation is a simple meter ranging from 1 to 10, just like report marks (see figure 11B). The meter functions as extra support to underpin the actual score. Because of the three colours, red – orange – green, users will instantly draw a conclusion whether the score is acceptable or not.

7.3 Features of the dashboard

A dashboard should be interactive, which means that the user should have the ability to interact with the data and retrieve more detail if necessary. These are the so-called interaction techniques. For instance defined by Liu et al. (2014) as selecting, filtering, highlighting and navigating. This section focuses on the features that the dashboard should have when implementing it in real-life.

- Interactive map: functions that a user should always have when working with maps are zooming and panning. The user should be able to zoom in and out to analyse the data with more detail. This function is automatically associated with a panning function, which allows the user to navigate to a different part of the municipality. Another function that would be beneficial for the dashboard is to make the map clickable. The map is divided into the 17 districts of Vught. When clicking on a certain district, the dashboard should switch to another screen that represents the exact same indicators and visualisations, but with the information of the clicked district. In this way, the user is able to retrieve more detailed information on district level.
- Clickable themes: with 'themes' the different indicators and corresponding visualisations are meant. When clicking on the metric for social cohesion for instance, the dashboard should switch to another screen that represents 18 metrics (all districts including the one of Vught) to allow comparison between the different districts. This should be possible for the stacked column graph, the circle diagram, the relation between specialised and basic care, the distance towards basis facilities and the social cohesion.
- Self-reliance radar: as mentioned earlier, the self-reliance radar should be interactive in the sense that the different types of regulations can be viewed. Clicking on the radar or scrolling with the mouse wheel should change the group of clients. In this way, the self-reliance of clients within these groups could be compared. Another feature which should be integrated in the dashboard covers a combination of the map and the self-reliance radar. Since it is the aim to increase the self-reliance of clients, it could be of interest to analyse *what* can possibly increase this. The user should have the ability to 'play' with objects within the map. For instance, does the self-reliance score on personal guidance increase for the group of clients that receive this type of care when the locations of personal guidance are placed close to the

clients? Or for the group of clients with a wheelchair regulation: does their everyday abilities increase when more modified properties are available in their direct environment? These analyses give the user the ability to visualise different scenario's which can support final decisions.

7.4 Conclusion

This chapter gave an answer to the fourth and last sub question: *What types of visualisations can represent the indicators and what features can support monitoring the objectives within a dashboard environment?* The visualisation types that are used for the final dashboard (appendix 9) are: (1) a stacked column chart to represent the amounts of clients per type of regulation developing over time, (2) a circle diagram to represent the proportions of the costs with regards to the overall budget, (3) a histogram to visualise the relation between specialised and basic care and the corresponding demand and supply, (4) the self-reliance radar for every group of clients concerning the different regulations, (5) a map that creates insight in the concentrations of clients and their relation towards basic facilities, (6) the percentage of clients with a shorter travel time than 10 minutes and (7) a score on social cohesion visualised in a metric. The features that the final dashboard should have are focused on making the dashboard interactive. An interactive map with zooming and panning functions, clickable themes to make comparison across districts of these themes possible and an analytical function with regards to the self-reliance of groups of clients should be integrated as interactive features. The starting point of the final dashboard was to keep it simple, as Richardson (2009) recommended. Familiar charts are used with consistency in colour-use to make it comprehensive for the end users.

8 Conclusion

This research aimed to answer the main question: *"What are the possibilities of a so-called dashboard fuelled with location-based information to monitor local policy with regards to the decentralisations in the social sector?"*. This main research question can be answered by the aid of four sub questions:

1. What are so-called dashboards fuelled with location-based information and what are its possibilities and restrictions?
2. In what sense can location-based information and data contribute to the overall information provision of municipalities with regards to the decentralisations in the social sector?
3. Which indicators correspond to the formulated objectives with regards to the decentralisations and in what sense can location-based information add value for monitoring these objectives?
4. What types of visualisations can represent the indicators and what features can support monitoring the objectives within a dashboard environment?

This chapter is dedicated to answering the main research question and corresponding sub questions. Since the sub questions are already answered in the conclusions of chapter 3, 5, 6 and 7, these are shortly addressed in this chapter.

8.1 Sub questions revised

The definition of a dashboard given by Few (2006, p. 34) is adopted for this thesis because it emphasizes on the visual aspect of a dashboard: "a visual display of the most important information needed to achieve one or more objectives; consolidated and arranged on a single screen so that the information can be monitored at a glance". The literature review in the beginning of this thesis showed that dashboards are a well-known form of business intelligence within the organisational sector. Performances are measured by using a simple dashboard that reflects the main objectives of an organisation. According to the literature, it seems that governments have not yet fully adopted this type of business intelligence, while especially Geospatial Business Intelligence (Geo-BI) could be of added value for governmental settings. After all, 80 percent of data have a spatial component (Bédard et al., 2006). Including location-based information in a dashboard "provides situational awareness" (Lechner and Fruhling, 2014, p. 57) and places situations in a spatial context (Geertman and Stillwell, 2004). Some practices of governmental dashboards showed that this form of business intelligence becomes more popular, but that the term 'dashboard' seems to be misplaced in some cases as they do not function as you would expect a dashboard to work.

The second sub question was dedicated to the viewpoints of various municipalities with regards to the contribution of location-based information in the overall information provision of the decentralisations. The viewpoints of municipalities were quite similar. Location could contribute in the sense that different target groups, facilities and certain issues within districts could be located to enable targeted approaches. The first aim for using location-based information is to gain insight in the overall situation (*what* is located *where*?) after which more analytical functionalities of location-based information should be implemented. Changes over time to measure the effects of implemented policy and making future projections are examples of this analytical approach. In practice however, the current scarce availability of data, difficulties in data sharing and privacy issues complicate the process of establishing a basis.

The translation from objectives towards indicators was a difficult process. The objectives were present, but due to the fact that the municipality of Vught still was in process on deciding how to operationalise these together with time restrictions resulted in own interpretations of the operationalisation. The willingness of the representatives was present and several meetings with these representatives resulted in a well-founded background to continue the operationalisation of the objectives. Five objectives were formulated by the municipality and the operationalisation resulted in 22 indicators. It was decided to lean on the overall aim of the Beleidsplan Wmo of the municipality of Vught: "As close as possible, as simple as possible". Seven indicators in total were selected to represent this aim.

The final dashboard of the seven indicators is presented in appendix 9. The visualisation types for the indicators are: 1) a stacked column chart to represent amounts of clients per type of regulation developing over time, (2) a circle diagram to represent the proportions of the costs with regards to the overall budget, (3) a histogram to visualise the relation between specialised and basic care and the corresponding demand and supply, (4) the self-reliance radar for every group of clients concerning the different regulations, (5) a map that creates insight in the concentrations of clients and their relation towards basic facilities, (6) the percentage of clients with a shorter travel time than 10 minutes and (7) a score on social cohesion visualised in a metric. An interactive map that allows comparison between different districts, clickable themes and an analytical feature concerning the self-reliance of different groups of clients are the features that make the dashboard interactive.

8.2 Final conclusion

Dashboards are useful tools for monitoring objectives because they present information at a glance and give the ability (in most cases) to retrieve more detailed information when necessary. The use of dashboards is common within organisations, but less common in governmental settings. This thesis research had the aim to investigate the possibilities for the implementation of a dashboard to monitor local policy. When developing policy in governments, objectives or aims are established. Measurements to the (desired) effects of this policy and if the objectives are achieved could ease the decision-making process. Various municipalities see the benefits of this approach and have already adopt this method to some extent for the improvement of the information provision within the decentralisations (municipality of Zaanstad, Eindhoven and Tilburg). From these experiences and as an outcome of this research, it can be concluded that a dashboard is a useful and effective tool for monitoring local policy in the social sector. Furthermore, location-based information and data could certainly add value for the information provision in the decentralisations in the sense that they enable a more targeted and customised approach for clients and to distinguish patterns and underlying relationships. However, the main conclusion of this research is that the implementation of a dashboard for this matter can only be successful provided that the objectives and especially the indicators are solid and that the availability of data is sufficient. The possibilities seem endless from a technical point of view. However, it should be clear *what* subjects are considered as most important to manage according to the end users. Including indicators on the final dashboard which not cover the objectives can result in disuse of dashboard. The emphasize during the implementation of a dashboard should therefore be on the operationalisation of the objectives.

9 Recommendations

Some recommendations derived as outcomes of this research. The first recommendation is to use the same methodology for the translation of objectives towards indicators as used for this research. The methodology of Veleva and Ellenbecker (2001) nicely represents the different steps that should be taken to establish proper indicators. As mentioned at the end of the final conclusion, the emphasize should be on the establishment of indicators since these are the basis of the final dashboard. A stepwise method supports this process. It is recommended to work results-oriented and to start simple. Never-ending discussions about the indicators should be avoided. Starting simple will promote results and makes further expansion more easy. Involve all important actors during the process of establishing indicators. It will dismiss a clash between the technical possibilities and demands from the content.

Another recommendation concerns the data issues. Establish agreements on the registration, sharing and storage of data to form a basis for implementations such as dashboards. Agree upon what is obligated to register and how this should be registered. In this case, every actor that interacts with the data can guarantee the quality of these data. Agreements concerning the privacy of data should be established to guarantee the privacy of clients. For instance, a distinction between *what*-information and *that*-information can be made (municipality of Schijndel, 2015). *What*-information specifies the (health)care indications and are more personal than *that*-information. The latter only indicates that a clients has a specific indication and has no further details. This is less privacy-sensitive.

Further research on the possibilities concerning the technical abilities for dashboard software is also recommended. Are the chosen visualisations and features for the final dashboard possible from a technical point of view? This is not included in this research while it is an important element of dashboards. It is also recommended to investigate the possibilities for a dashboard with regards to the decentralisations for another municipality. The research is now biased and no firm conclusions can be drawn about the effectiveness of dashboards as information provision tool for the decentralisations. Besides applying the same approach (decentralisations) for another municipality, it is recommended to investigate the possibilities for implementing a dashboard to monitor local policy for another policy domain besides the social sector. The social sector was chosen for this thesis because of the topical character, but a dashboard might be interesting for other policies within a municipality.

10 Discussion

In the beginning of this thesis research, the discussion about demand- and technology-driven solutions is addressed. It was stated that Smart Cities often adopt the technology-driven approach which is the assumption that the supply-sided process of technological innovations will lead to innovative uses (Peters et al., 2012). It is an emphasize on technical solutions on how to deal with modern problems. As an outcome of this research it seemed that new implementations for the improvement of the information provision within the decentralisations were often technical-driven instead of demand-driven. As stated in the beginning, this is risky since a focus on technology could overlook the real problems and demands (Peters et al., 2012). The technical possibilities are endless, however the demands should be the guidelines for further implementation and not the technical possibilities. For the case of this research were two different 'worlds' meet, the social sector and the more technical (geo-) information sector, this clash is noticeable. The social sector has limited knowledge of technical possibilities and which instruments are useful for support, while the technical (geo-) information sector has limited knowledge of the substantive issues within the social sector that need support. They do not speak the same language. Therefore, there must be a balance between the two drivers. The demands should be clear and demarcated and the technological supply should be taken into account during this demarcation.

Besides this general discussion point, there are several discussion points that are focused on the research process and results. The first one is the timing of this study. The timing of this research has two sides. On one side, it is an interesting and topical subject to investigate. It is the beginning of new developments which makes the subject fictile. On the other hand, this slowed down the research process. The research took place during the hectic times of the transition phase. Important representatives where hard to reach because of this timing.

Another discussion point is the lack of knowledge with regards to the decentralisations within the social sector. This was especially the case for the operationalisation phase of this research. The operationalisation is based on own interpretations and could misjudge the essence of the dashboard. Substantive issues are unknown and for a research approach as for this thesis, it is hardly impossible to ignore the content. Own interpretations could possibly result in a disuse of the final outcomes because they might not reflect the actual issues.

The use of a case study limits more general outcomes. The second part of this thesis research is entirely based on the municipality of Vught. Applying the same method and approach as used in this thesis for another municipality could result in entirely different outcomes. The focus on just one case study has also resulted in a biased view on the data availability and structure. The scarce availability of data for the case study resulted in the generation of own fictive data. Some municipalities might have a data warehouse which lends itself for the development of a dashboard which leads to different outcomes in the end.

The last discussion point is dedicated to the emphasize on the visual aspect of dashboards without paying attention to the possibilities of dashboard software. It is assumed that there are numerous technical solutions and that there are no limitations concerning possibilities for technical features. Besides this, caution is needed when developing visualisations. It is the aim to communicate certain messages and the end users should interpret them in the intended way. Caution is needed to not communicate a wrong message due to a specific visualisation type or colour.

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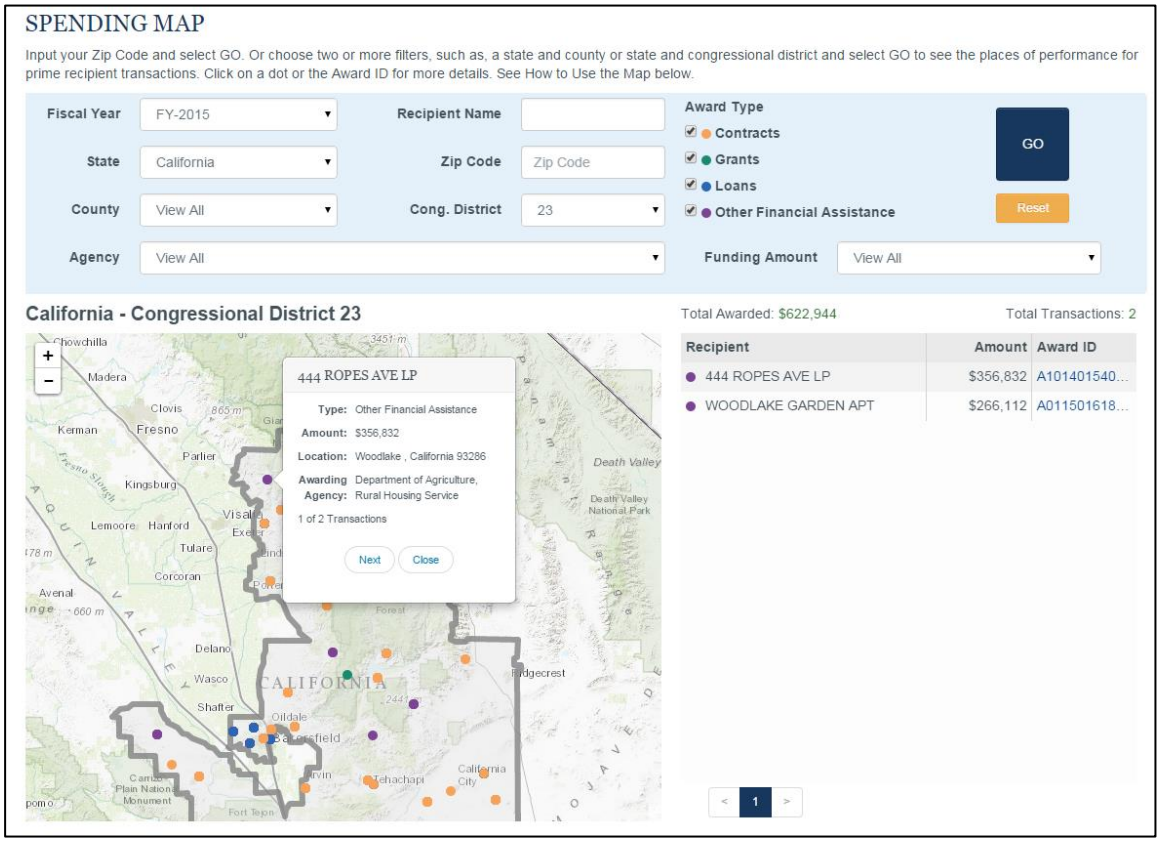
Appendices

Appendix 1 – Key registrations in the Netherlands

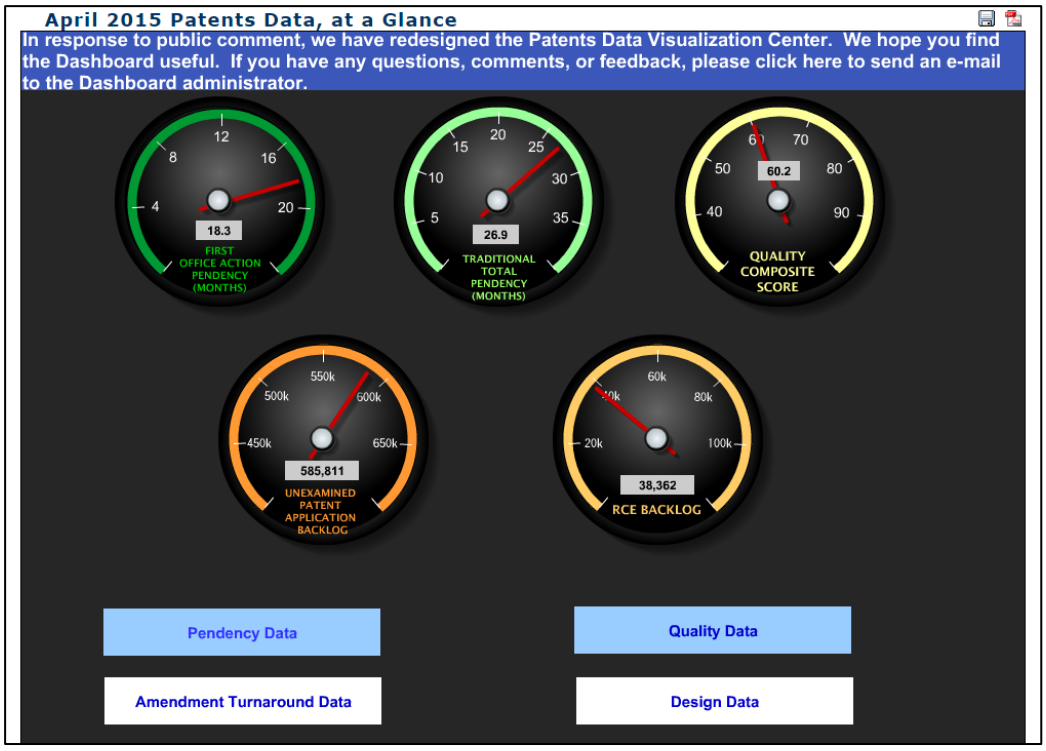
Key register	Abbreviation	English translation	Type of data	Source holder(s)
Basisregistratie Voertuigen	BRV	Key register for Vehicles	Vehicles and their owners	RDW
Basisregistratie Inkomen	BRI	Key register for Income	Collective and taxable income: for the assessment of funding's	Tax administration
Basisregistratie voor Lonen, Arbeidsverhoudingen en Uitkeringen	BLAU	Key register for Wages, Labour Relations and Benefits	Polis administration	UWV
Basisregistratie Kadaster	BRK	Key register for Cadastral cases	Parcels, ownership, mortgages, user rights and pipeline networks	Kadaster
Basisregistratie Topografie	BRT	Key register for Topography	Digital topographic files on different scales	Kadaster
Basisregistratie Grootschalige Topografie	BGT	Key register for Large-scale Topography	Detailed digital map with all physical objects (buildings, roads, water)	Municipalities, provinces, water boards, Pro Rail, Ministry of Defence, EL&I and I&M
Basisregistratie Ondergrond	BRO	Key register for Subsurface	Geological structure of the subsurface	Municipalities, provinces, water boards, Ministry EL&I and I&M
Basisregistratie Waardering Onroerende Zaken	WOZ	Key register for Real Estate Value	Determined value of real estate	Municipalities
Basisregistratie Personen - **Inhabitants** - **Non-inhabitants**	BRP	Key register for Personal Records	Personal records of all residents within the Netherlands or non-inhabitants of the Netherlands, but with a relation with the Dutch government	Municipalities
Handelsregister	NHR	New Trade Register	Enterprises, activities and their location	Chamber of Commerce
Basisregistratie Adressen en Gebouwen	BAG	Key register for Buildings and Addresses	Administration of all buildings and addresses	Municipalities

Appendix 2 – Examples of governmental dashboard in the U.S.

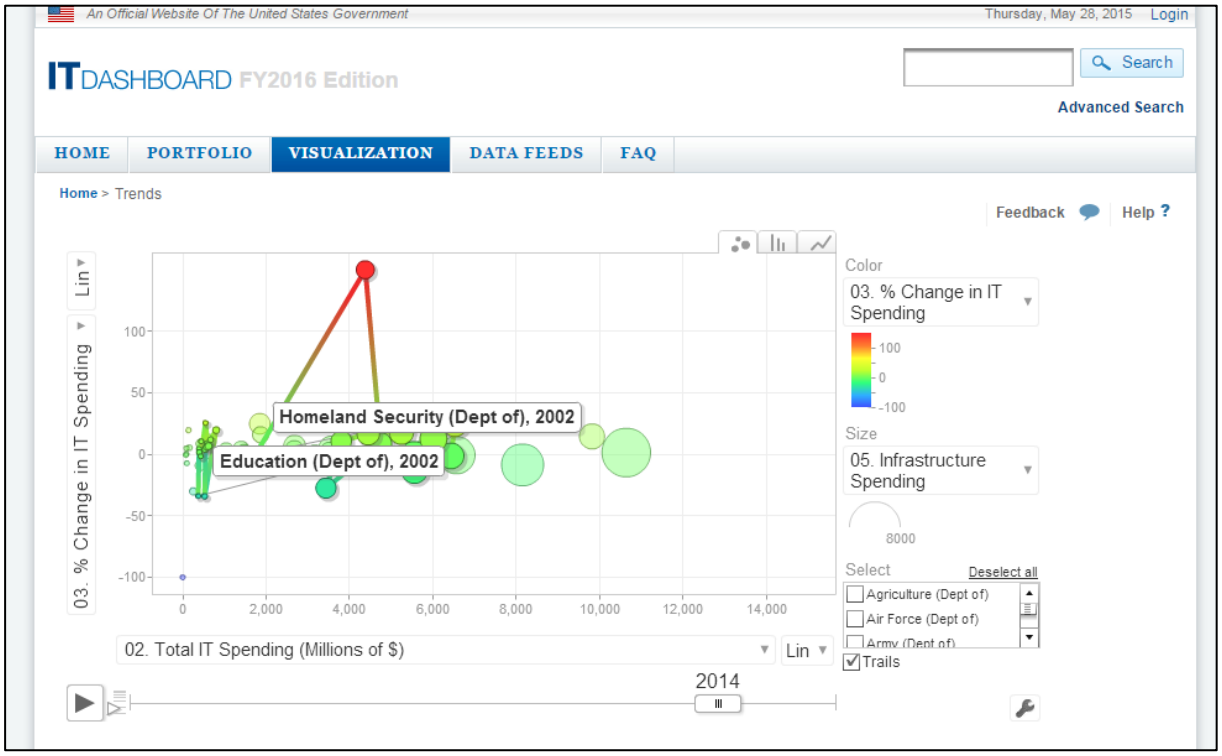
Financial dashboard



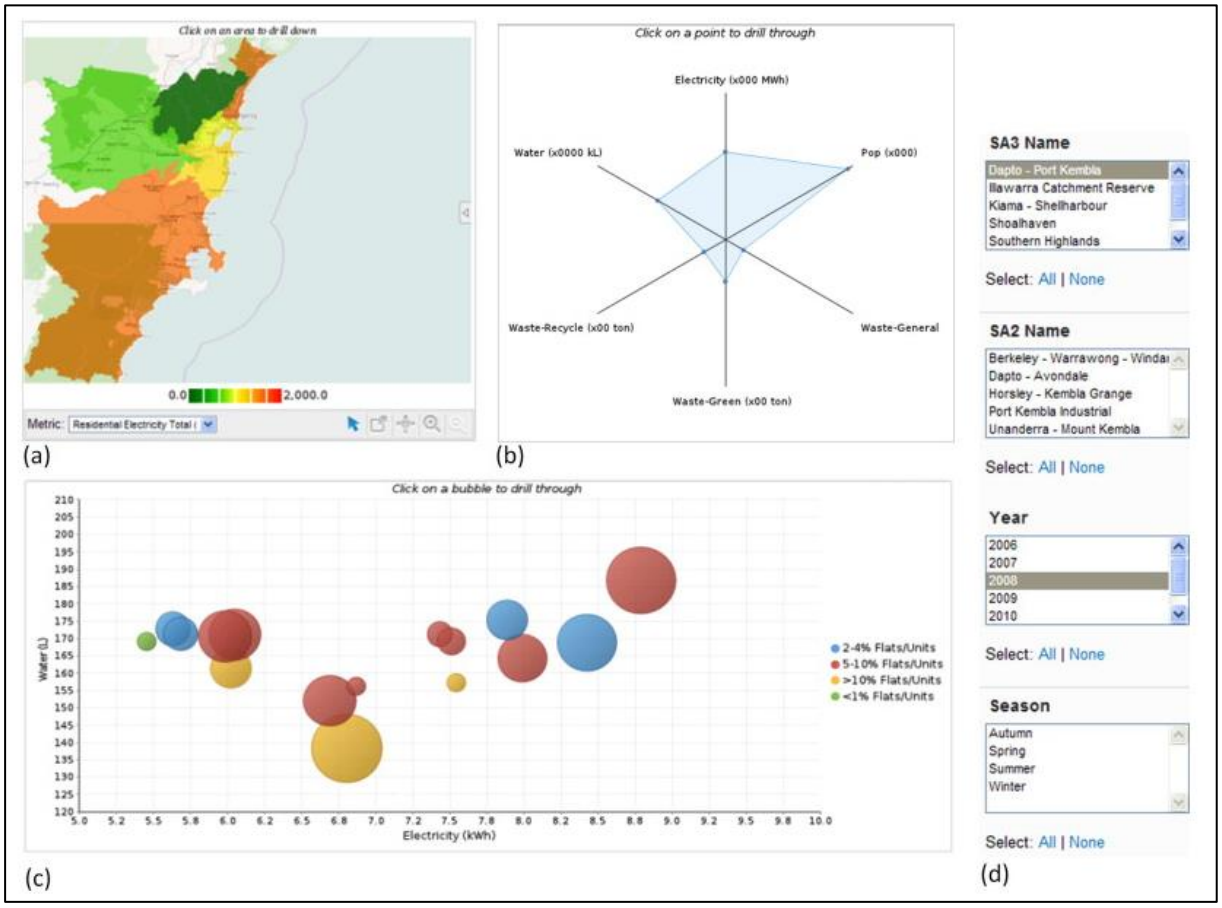
Agency specific dashboard: U.S. Patent and Trademark Office



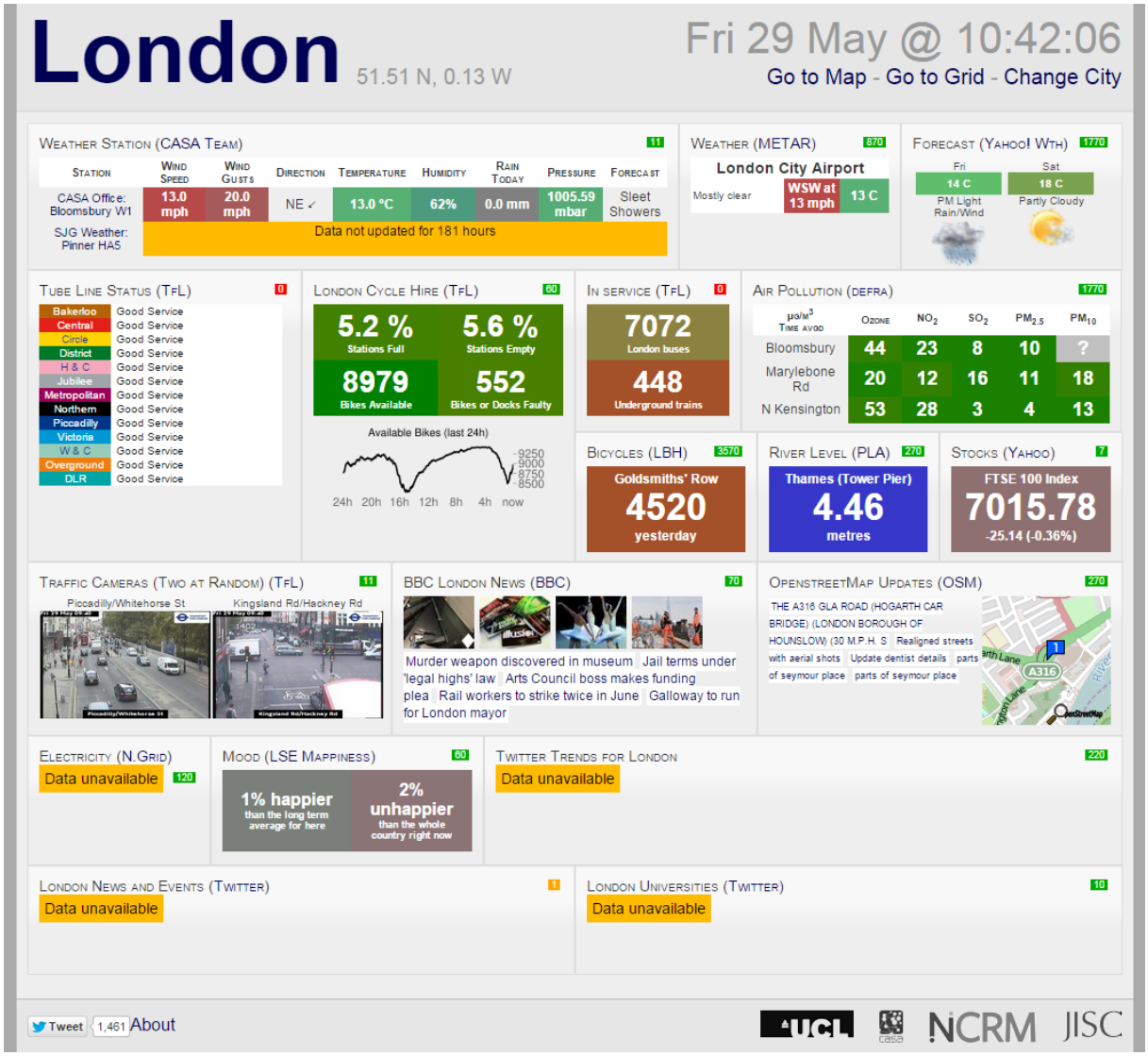
IT Dashboard for E-Government and Information Technology



Appendix 3 – Example of dashboard in Illawarra region, Australia

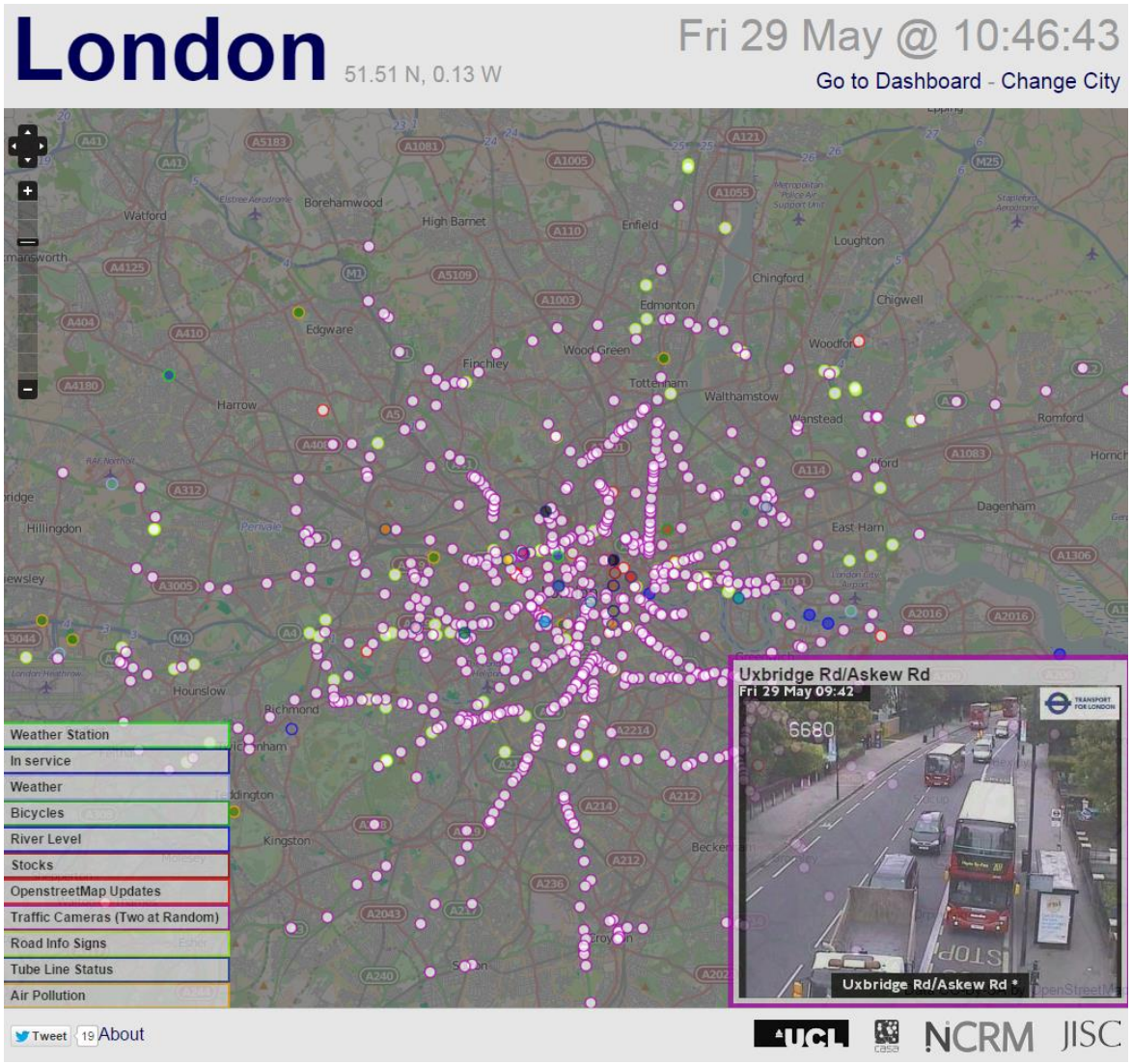


Appendix 4 – London City Dashboard home screen



Source: http://citydashboard.org/london/

Appendix 5 – London City Dashboard map

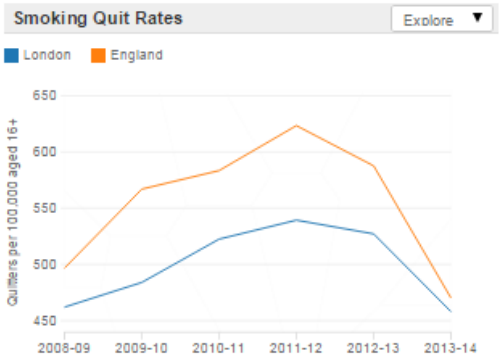


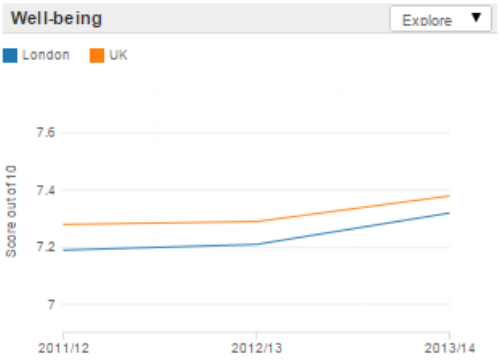
Appendix 6 – Administrative dashboard London

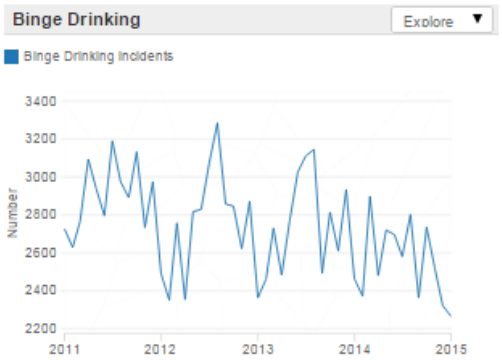
Smoking Quit Rates: **458 per 100,000** ▼13% on same quarter last year

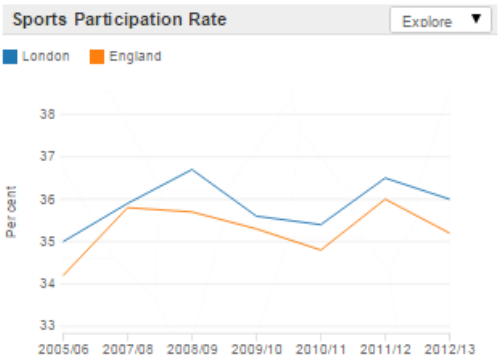
HEALTH

The Mayor has a general duty to improve the health of all Londoners and a statutory duty to reduce inequalities in health outcomes across the capital. The Mayor doesn't have any responsibilities for health service provision in London but does work in partnership with expert organisations to help reduce London's health inequalities. The Mayor works closely with the NHS and health sector (including Public Health England, NHS England, academic health science centres, hospital trusts, and the London Ambulance Service), boroughs and other organisations to ensure that London is getting the care it needs.









Appendix 7 – Atlanta Dashboard

Appendix 8 – Interview topics

What questions arise with respect to the decentralisations in the social sector?

- What aspects

What are the difficulties concerning the information provision within social sector?

- Data availability and quality
- Unclear questions from the management within the social sector
- Too much/too few indicators

How does this municipality tackles or improves the information provision within the decentralisations?

- What steps are necessary to take for the improvement of the implementation of daily tasks?

In what stage are the developments concerning the combination of geo-information and the social sector for this municipality?

- What is the motivation for combining these two sectors?
- Encouraged from: social sector or geo-information sector?

What is the added value of a combination of the decentralisations and geo-information?

- What are the opportunities for this combination?

How is the data structure arranged for this municipality?

- Is there one data warehouse that stores significant information?
- Is there enough data available for supporting the information provision of the decentralisations?
- Are there any difficulties concerning data (availability, quality, sharing etc.)?

What could be the added value of a dashboard as information provision tool for the social sector?

- End-users of the dashboard: who will mostly benefit from a dashboard?
- What are essential elements of a dashboard for this matter?
    - In the field of the information content
    - In the field of dashboard features

Which indicators add the most value to the dashboard for the comprehensiveness of the decentralisations within the social sector and for monitoring certain issues?

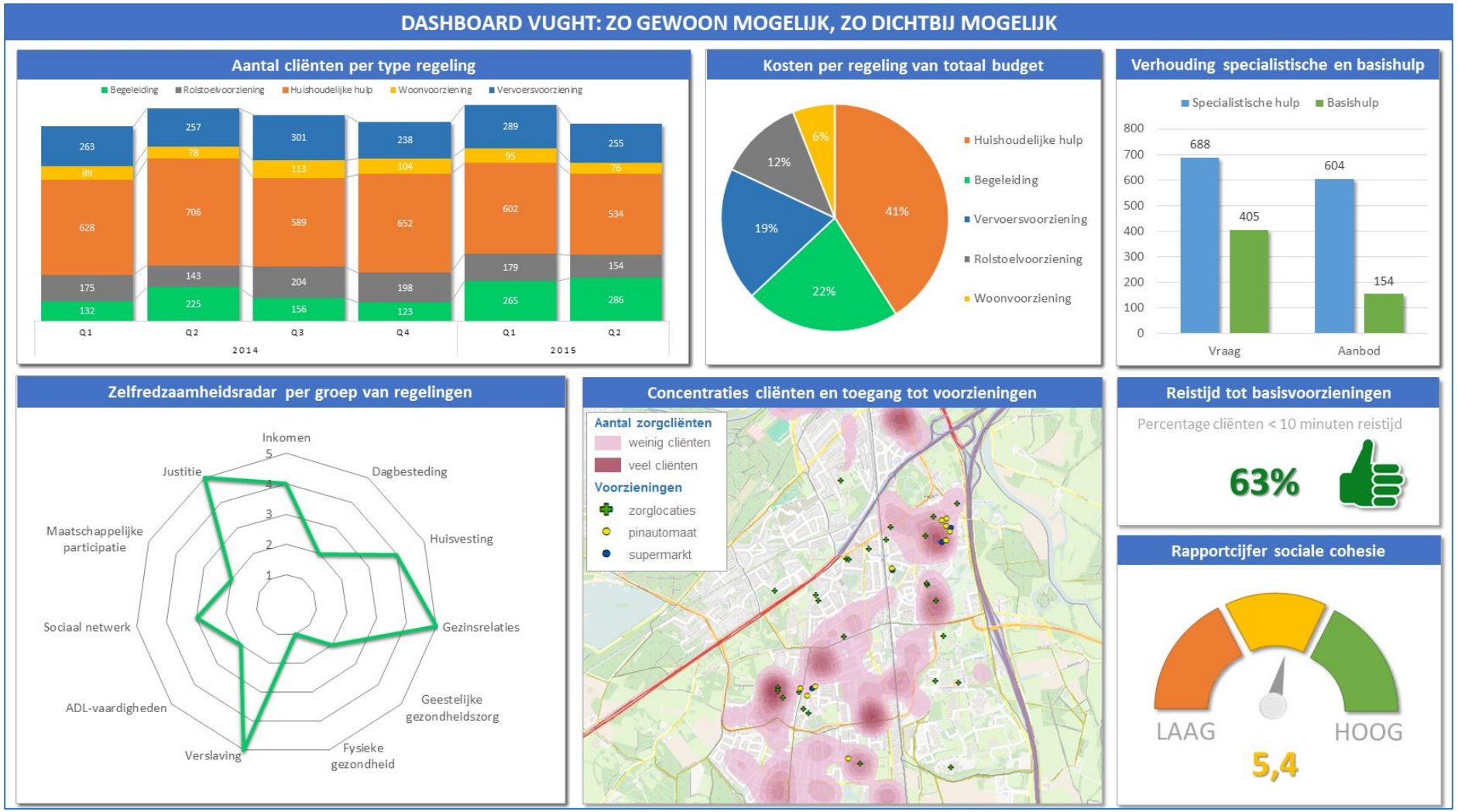
- What indicators are required according to you?

What type of visualisations should be part of the dashboard?

- Map – graphs – charts – numbers
- How should location-based information be included?

What would be the innovative element for implementing a dashboard as support tool for the information provision in a certain sector?

Appendix 9 – Final dashboard Vught: as close as possible, as simple as possible



Appendix 10 – Processed interviews (Dutch)

	Gemeente Eindhoven	Gemeente Tilburg	Gemeente Zwolle
Datum	13-04-2015	15-04-2015	01-05-2015
Geïnterviewde en functie	Heidi van der Vloet: senior projectleider Geo gemeente Eindhoven John Lenz: programma manager informatievoorziening sociaal domein	Paul ten Have: tactisch adviseur (geo)-informatievoorziening gemeente Tilburg Mabel Giesbers: beleidsadviseur Wonen, Welzijn en Zorg gemeente Tilburg	Marcel Broekhaar: consultant geo-informatie gemeente Zwolle
Implementatie/applicatie	Cognos dashboard met Esri plugin	Wijkservice monitor/scan + Cognos Dashboard met uiteindelijk Esri plugin Cognos heeft tools/functionaliteiten om data te visualiseren	Viewer met feitelijke informatie (cliënten Wmo, cliënten binnen participatie budget, mensen met meedere regelingen) op buurtniveau.
Uitgangspunt van implementatie	De bezuinigingen van €5 miljard op jaarbasis. Deze bezuiniging moet gehaald worden uit het anders organiseren van je zorgaanbod. Eindhoven heeft een budget van €420 miljoen op jaarbasis waar de totale zorg mee gefinancierd moet worden.	Wmo toekomstverwachting: in welke wijken gaat wat plaatsvinden? Levensloopbestendigheid: voorzieningen in de buurt bijvoorbeeld. Allerlei gegevens combineren om dit in beeld te krijgen (idee is er, nog niet uitgewerkt) Inzicht en doelgerichter werken. Sociale wijkteams. Proactieve benadering omdat je dingen al in beeld hebt Inzicht in de wijk wat er aan voorzieningen en mogelijkheden zijn Later stadium: groeimodel of prognoses genereren. Maar hier is eerst inzicht voor nodig,	Hoe kan de afdeling Onderzoek en Informatie het sociaal domein ondersteunen? Een beeld op buurtniveau geeft een goede indruk wat voor mensen er in het wijkteam moeten zitten. Techniek is wel aangespoord, maar ook tricky om dat te zeggen. We zijn altijd ondersteunend, het draait om de vraag vanuit het sociaal domein. Wat speelt er, en waar gaat het om (technology push / demand pull?)

		anders kun je deze 'schuifjes' niet bouwen	
Status van implementatie	Testomgeving is ontwikkeld en wordt getest. Onderzoeken bij welke indicatoren een kaart meerwaarde kan hebben. Fase 1 (januari 2015): realisatie indicatoren voor de Raad, zonder kaart Fase 2 (juli 2015): prioriteren van de 170 indicatoren Fase 3: data kwaliteit	Filteren in de vragen en bekijken wat nou echt van belang is om op te sturen. In juli eerste presentatie en overleg hierover Wijken vergelijken: waar gaat het goed en slecht en waar ligt het aan? We starten met hetgeen wat minimaal vereist (schoolverlaters, toereikende financiën, impulswijken: ieder gezin een kostwinner, dak boven het hoofd) is en dit bouwen we verder langzaam uit. Waar hebben we zelf veel meer behoefte aan?	Er is nog geen duidelijk beeld van de indicatoren/vragen die een bepaald verschijnsel kan weergeven. Dit is een enorme zoektocht. September presentatie geven op ESRI conferentie: stok achter de deur om door te gaan.
Doelgroep	Meerdere: verschillende doelgroepen in de vorm van tabbladen (de Raad, het College, Sectorraad, Afdelingshoofden, wijkteams).	Verschillende: wijkteams, medewerkers gemeenten, GGD, maatschappelijk werkers, jeugdzorg. Nog niet duidelijk wie wat kan zien. Uiteindelijk de burgers ook toegang hebben: zelfredzaamheid.	Wie de doelgroep wordt is sterk afhankelijk van waar het over gaat. We geven toegang tot gegevens tot die mensen die het echt nodig hebben en niet meer.
Vragen binnen het sociaal domein	Welke wijken maken welke kosten? (plaatsing van wijkcentra etc) Ontwikkeling van verschillende wijken Algemene voorzieningen op binnen de verschillende wijken Instroom is een belangrijke indicator:	Wijkservicescan: (1) dashboard inzicht in waar wonen mensen met Wmo voorzieningen (2) wat is de toekomstverwachting (3) waar zijn de voorzieningen (waar liggen aangepaste woningen en zorgvoorzieningen, waar gemeentelijke gebouwen die te kampen krijgen met leegstand) Bevolking en langer thuis wonen: 75-plussers	Platte informatie over de omgeving (waar zit wat: dagbesteding etc.). Feitelijke informatie inzichtelijk maken. Ouderen langer thuis laten wonen: waar is daar geschikt vastgoed voor gelokaliseerd? 'Kwetsbare' burgers in beeld om

	hoeveel nieuwe gevallen/indicaties zijn er gesignaleerd of afgegeven per maand? De totale uitstroom Individuele benadering van cliënten	(korte afstand voorzieningen) Wat zijn de basisvoorzieningen die mensen nodig hebben om langer thuis te kunnen blijven wonen? Zo min mogelijk dure voorzieningen: welke voorzieningen/activiteiten dragen bij aan het langer thuis wonen zonder dat het hele dure ingrepen zijn die wij als gemeente betalen. Inzichtelijk krijgen van initiatieven vanuit de wijk is ook van belang Verbanden leggen tussen thema's Impulswijk: kostwinner, dak boven het hoofd, participeren Waar zijn voorzieningen gelokaliseerd? 'Kwetsbare' burgers: 75+ - langer thuis wonen + participeren Waar is leegstand? > voorzieningen lokaliseren Minimaal vereist: schoolverlaters, toereikende financiën, impulswijken (ieder gezin een kostwinner, dak boven het hoofd, participatie), in- en uitstroom, zelfredzaamheid	voorzieningen op aan te passen Burgerprofielen: huishoudens krijgen een label dat gebaseerd is op koop- en internetgedrag en automerk bijvoorbeeld. 14 burgerprofielen waarvan ieder 100 indicatoren. Burgers met meerdere voorzieningen Indicator X, Y, Z die geven een bepaald verschijnsel of probleem weer die je goed met een locatie kunt benadrukken en weergeven. Voorbeeld: nieuwe plekken voor elektriciteitspalen voor oplaadbare auto's: er moet een parkeerplek zijn, en de parkeerdruk mag niet te hoog zijn. Een combinatie van deze informatie geeft inzicht in nieuwe plekken. Voorspelling: hoe gaat het zich ontwikkelen. Welke mensen bevinden zich waar in de gemeente? Prognoses o.b.v. burgerprofielen Cliënten in beeld krijgen Waar zit wat? Woningbouwcorporaties etc. worden ook benaderd om samen te werken. Wat

			is het aanbod van vastgoed? Voor wie is dit geschikt? Wat heeft een doelgroep nodig? Afstanden tot voorzieningen, sociaal netwerk (ontmoetingsplekken). Bevolkingsonderzoek wordt hier ook voor gebruikt.
Hoe is de applicatie ingericht? Wat is er te zien en wat zijn de opties?	Een Cognos omgeving waarin een tabel omgevormd kan worden tot een grafiek of kaart. Er kunnen management rapportages opgebouwd worden. Koppeling van allerlei databronnen. Tabellen met aantallen op wijkniveau. Kaart presenteert de aantallen uit de tabellen op wijkniveau (choropleet). Verschil tussen structurele rapportages, ad hoc reportages of om analyses te doen	Per servicewijk (per 10.000 inwoners) gegevens krijgen, misschien net iets dieper. Servicewijk bestaat soms ook wel uit 10-12 buurten/wijken, en dit is het diepst wat je zou moeten gaan. Al onze informatie uit de wijkscan bijvoorbeeld zijn te herleiden naar dit subwijk niveau. Op zorg vinden we het al genoeg op servicewijk niveau (per 10.000 inwoners dus). Veel in overeenkomst met gemeente Eindhoven Voorbeeld dashboards (niet gericht op sociaal domein maar andere toepassingen). Afdeling sociaal komt er bij. Doelen zijn geformuleerd en worden ondersteund met metertjes/pijlers. Doorklikken op dingen. Cijfers zijn nu voor heel de gemeente, maar je wilt juist zien waar het zich concentreert.	Een eigen viewer obv ArcGIS Online met allerlei thema's voor geografische weergaven
Moeilijkheden voor de implementatie of binnen	Het formuleren van de managementvragen die er spelen	Het sociaal domein is heel breed	Het was moeilijk om de afdeling Onderzoek en Informatie te betrekken

het sociaal domein	De overvloed aan indicatoren die opgesteld zijn (170) en de warrige formulering hiervan Technisch alles mogelijk, maar ik moet wel weten wat ik moet bouwen en wat het inhoudt of wat het is De combinatie van weten wat er technisch mogelijk is, wat de vragen zijn en welke informatie er beschikbaar is: te laag informatie bewustzijn Managers weten niet welke klokjes ze op het dashboard willen Niveau verschil aan informatiebehoeften tussen verschillende doelgroepen Het wordt aangejaagd vanuit de techniek omdat we weten dat het kan	Waar halen we valide bronnen vandaan? Jeugdzorg is een lastig domein voor gemeenten, het is nieuw voor ze en daar hebben we het drukst mee, onze wijkteams ook. Doordat we verschillende doelen hebben met onze wijkservice monitor zijn er veel mensen betrokken die met 1 specifiek onderdeel bezig zijn. InfoGIS wordt nog niet echt vaak gebruikt op de werkvloer. Ze stellen de vraag aan Mabel terwijl ze er zelf ook toegang tot hebben: het zijn twee verschillende werelden. Gegevens krijgen. Financiën in beeld krijgen van Jeugdzorg. Enorm hekelpunt. Heeft ook met het stelsel te maken, helemaal aan het eind vindt de facturatie plaats en daarom weten we niet of dat bedrag klopt.	bij het sociaal domein omdat die mensen erg druk zijn om alles op orde te krijgen. We willen helpen, maar het is moeilijk om daar ruimte voor te vinden. Herkenbaar dat het formuleren van vragen erg moeizaam gaat. Je moet samenwerken, met meerdere mensen van het sociaal domein. Inhoudelijke bepalingen zijn erg lastig. Tijdsdruk: het is nog erg hectisch. Privacy is ook wel een obstakel.
Data issues	Om volledige voorspellingen/prognoses te maken over het cliëntenbeeld bijvoorbeeld, missen we bepaalde informatie: Jeugdzorg. Zij weigeren ons de bestanden te geven ivm privacy Informatie is soms niet helemaal betrouwbaar door niet-ingevulde attributen	Datawarehouse werkt heel goed, maar het is erg tijdrovend om alles bijvoorbeeld synchroon te laten lopen Ziekteverzuimcijfers bijvoorbeeld: 3 systemen om het bij te houden, wat is waar? Tijdens overleg gaan we bepalen welk cijfer gepresenteerd wordt. Waar halen we bepaalde valide gegevens	Gegevens zijn moeilijk te verkrijgen, en daarnaast verschillen ze veel van elkaar. Het matchen hiervan is heel ingewikkeld (postcode niveau of op adres). Het idee is volgens mij wel dat het meer gestructureerd wordt. CBS speelt hierbij ook een rol volgens mij.

	Ze leggen deze data issues bij de ICT afdeling neer, omdat ze denken dat zij van de informatie en data zijn.	vandaan? Huisartsen en zorgverzekeraars geven de cijfers niet. Zijn we landelijk (met meerdere gemeenten) over aan het praten hoe we dit aan kunnen pakken. Het is moeilijk om gegevens te krijgen. GGD: veel op stadsniveau, om de 4 jaar. Verschillen in klantvolgsystemen (Excel lijsten zijn nu die alleen werken). Het functioneert, en de informatie die er in staat is erg bruikbaar, maar de verschillen maken het moeilijk. Het delen van data is niet gebruikelijk bij sommige partijen.	
Data structuur	Zodra een vraag/analyse aan het Cognos systeem opgedragen wordt, gaat hij data uit verschillende databronnen halen. Het voordeel is dat het real-time data is, maar dit vergt wel veel van de performances van het gehele systeem. Voor gebruikers binnen het systeem wordt alles trager. Daarom is er in de arhitectuur een datawarehouse opgenomen: 's nachts worden alle systemen leeg getrokken en de datawarehouse staat op een snelle server waarmee je een snelle verbinding kunt maken. Schuldhulpverlening willen wij integreren binnen het sociaal domein, maar er was geen koppeling tussen het datasysteem (Allegro) waar dat in stond en Cognos.	Eén informatie huishouding (project) zodat er één waarheid is mbt de verschillende database bestanden. Koppelen van gegevens is ook strikt, maar om inzicht te krijgen is het soms nodig. Dan wel op een hoger aggregatieniveau. Met Cognos kun je uit allerlei andere bronsystemen data halen, dit zetten we in één datawarehouse en vanuit daar haal je de gegevens naar je dashboard. Dit wordt iedere nacht ververst.	Richten de data op een zodanige manier in dat het raadpleegbaar moet zijn voor degene die het uiteindelijk gaan gebruiken en mogen gebruiken.

(omgang) privacy	Niets is herleidbaar tot een persoon, echter als je doorklikt zou je het kunnen achterhalen omdat het technisch nog niet afgeschermd is. Het doorklik niveau wordt wel beperkt. GBA is erg afgeschermd bij gemeente Eindhoven, er wordt niks gekoppeld op personen. Het beleid is erg conservatief. In structurele rapportages moet en mag het niet herleidbaar zijn naar een persoon, voor je ad hoc reportages ook niet, voor analyses wel. Je hebt de BSN informatie nodig voor analyses: wel beperken tot data analysten	Als het op de gegevens van Jeugdzorg aan komt, is er al snel een privacy alarm. Het is wel op een zodanige manier te aggregeren dat het niet meer herleidbaar is. Heat maps: geen exacte locatie is zichtbaar, maar een wolk van concentraties. Privacy blijft lastig, maar als je het op een hoger abstractieniveau (dus niet op persoons- of huishoudniveau) presenteert, bijvoorbeeld een buurt, kan het minder kwaad. Als je het op buurtniveau presenteert moet je wel afwegen of als het maar 1 geval is binnen een buurt, of het verstandig is het te presenteren.	Je zou eigenlijk alles op BSN vast willen leggen. Maar als je bestanden gaat combineren komt al snel privacy om de hoek kijken. Je komt al heel snel bij het feit aan dat gegevens dan gebruikt worden voor andere doeleinden dan waarvoor ze vastgelegd zijn. We hebben richtlijnen opgesteld wat wel en niet mag, de wet zegt daar ook dingen over. Dat is volgens mij voor iedereen hetzelfde maar het wordt verschillend geïnterpreteerd. In een beschermde omgeving onderzoeken we wel dingen of het helpt, en daarna komt de privacy regeling. Privacy staat soms de innovatie in de weg. Data op adresniveau vaak beschermd met een wachtwoord.
Combinatie geo en het sociaal domein	Eindhoven is één van de vijf Living Labs in Nederland voor best practices binnen het sociaal domein Wijkteams hebben behoefte aan gedetailleerdere informatie binnen een wijk: welke voorzieningen zijn er? Advies geven over visualisatie	Vragen: waar zit wat? Sociale wijkteams gerichter laten werken Komt vooral vanuit het sociaal domein. GIS viewer wordt gepromoot om gebruikt te worden. Maar de vragen komen vooral uit het vakgebied zelf. Analyses hebben nog kansen, kaartlagen over	Verschillende problematieken in een gemeente signaleren. Waar speelt zich wat op het moment af? En hoe gaat zich dit verder ontwikkelen? Het combineren van verschillende gegevens en dit aan een locatie koppelen is wel het voornaamste waar de combinatie goed voor zal zijn.

	mogelijkheden voor de juiste interpretatie (bijvoorbeeld luchtfoto's, postcodegebieden voor fijnmazigere visualisaties, statistische informatie)	elkaar heen leggen is inderdaad handig, maar echt een analyse voegt nog meer waarde toe. Verbanden leggen tussen inkomensvoorzieningen en Wmo voorzieningen bijvoorbeeld. Dit biedt ook kansen voor geografie.	
Visualisatie	Medewerkers van WIJ Eindhoven hebben een gedetailleerdere kaart nodig dan bijvoorbeeld een choropleet	Heat maps Servicewijk niveau en subwijk niveau	Als we data verwerken is het puntdata, maar zodra het naar buiten gaat wordt het altijd geagregeerd naar buurtniveau: choropleet. We gebruiken ook een dichtheidsberekening: een heatmap. Je ziet meer detail en ziet plekken waar echt iets gebeurt. Op buurtniveau is dit nog te generaliserend. Het wordt plat geslagen en daar moet je mee oppassen.
Dashboards algemeen	NVT	Veel gebruik van dashboards: project één informatiehuishouding > één waarheid, één plek voor informatie. Gericht om dashboards te bouwen Vaak is er bepaalde sturingsinformatie nodig vanuit beleidsperspectief en dan gaan wij kijken welke data er nodig is om het weer te geven op een dashboard. Veiligheidsdashboard is al ver ontwikkeld, ook met kaartjes erbij: gevaarlijke plekken in Tilburg.	Groot fan van dashboards omdat er zoveel informatie beschikbaar. Er zijn veel ingewikkelde manieren om deze informatie te consumeren. Het is vaak een drama om er doorheen te ploeteren. Wij willen iets maken voor de Raad. Een soort informatie protaal. Maar dan moeten we wel weten wat zij nodig hebben.
Inrichting dashboard	Door het gebruik van cirkeldiagrammen en	Cirkel diagrammen handig, ook op een kaart dat	Goede indicatoren zijn een must voor

	het feit dat ze niet handig te lezen zijn, zijn wij kaarten gaan gebruiken.	je dit per wijk kunt zien. Een ieder geval een grafiek dat je per wijk de ontwikkelingen kunt zien. Heat map heeft als voordeel dat je heel goed kunt zien waar het 'warm' wordt. Geeft aan waar dingen samen komen. Koppelingen/leggen van verbanden tussen verschillende groepen, spreekt makkelijk op een kaart	een dashboard. 10 belangrijkste cijfers moeten zichbaar zijn in de vorm van buttons bijvoorbeeld. Daar zou je op door kunnen klikken voor meer informatie. Verschillende thema's dus. Het is wel echt ingewikkeld om de juiste informatie te presenteren die nodig is. Je moet eerst inzichtelijkheid hebben, dan meer detail. De kaart zou er een facet van moeten zijn. Het ligt er ook aan voor wie het uiteindelijk gemaakt wordt. Voor iemand werkzaam in een sociaal wijkteam kan een kaart heel handig zijn, voor iemand anders weer niet. Verder moeten indicatoren in metertjes of grafieken gepresenteerd worden. En snel switchen tussen verschillende indicatoren.
Overig		Nodig om met verschillende mensen rond de tafel te gaan om alles concreet te krijgen: mensen van beleid, wijkteams, sociaal domein, informatievoorziening. Mensen enthousiast te krijgen en mee te nemen in de ontwikkeling. Ook zorgverzekeraars etc. Zij zouden ook uiteindelijk bij de gegevens moeten kunnen.	

	Gemeente Capelle aan den IJssel	Gemeente Zaanstad	Gemeente Bernheze
Datum	07-05-2015	19-05-2015	27-05-2015
Geïnterviewde en functie	Arjan van Etten: senior adviseur geo-informatie	Mark Smit: afdelingshoofd procesinrichting en gegevensbeheer/monitoring	Michiel van Loon: beleidsmedewerker geo-informatie Hans Schuurmans: beleidsmedewerker sociaal domein Lia Cortenraad: manager van het domein Samenleving
Implementatie/applicatie	Nog niets, zijn bezig met ideeën te verzamelen voor een implementatie. Idee is om iets te integreren in eigen GIS-viewer: VIS	Dashboard voor het sociaal domein (standaard) Dashboard voor het sociaal domein met kaartinformatie	Nog geen concrete plannen voor een implementatie, maar zijn aan het bedenken wat meerwaarde kan hebben
Uitgangspunt van implementatie	NVT	Beter inzichtelijk krijgen van welke voorzieningen er binnen een wijk zijn en welke problematiek er zich afspeelt om zo gerichter te kunnen sturen en aan te pakken. Ook de bezuinigingen en het idee dat het anders moet. Niet zozeer op individueel niveau, maar meet op huishoudniveau of gezinsniveau. Wat is het effect van de gerichte aanpak die voortgekomen is uit het inzicht?	Een implementatievorm is nog niet concreet, maar het doel is inzicht geven. Hoe kan (geo-)informatie helpen om dit inzicht te creëren?
Status van implementatie	Beginnende fase: aftasten wat de mogelijkheden zijn en rondkijken bij andere gemeenten en informatie die KING verzamelt. Ideeën zijn er wel genoeg, maar	Werkend dashboard dat ook al gebruikt wordt. Verder door ontwikkelen en scherp krijgen van vragen en stuurbare indicatoren.	Aftasten wat de wederzijdse wensen zijn en wat (geo-)informatie voor het sociaal domein kan betekenen.

	moeten nog verder uitgewerkt worden Open podium: hebben laten zien wat we allemaal kunnen met kaarten, om zo interesse te wekken bij de collega's		We hebben een pilot gedaan voor de interne viewer voor maatschappelijke ondersteuning. Veel meer geld is daarvoor beschikbaar.
Doelgroep	De mensen binnen het sociaal domein. De beleidsmakers bijvoorbeeld. Hier moeten we ook nog verder over nadenken. Het gaat er om om hier in ieder geval alvast de interesse te wekken. Afhankelijk van het thema wat gepresenteerd wordt en wie toegang tot de bepaalde informatie mag hebben.	Sociale wijkteams Leidinggevenden > procesinformatie, aantallen, trends, positionering: waar in de wijk (hoogste informatieniveau) Beleidsmedewerkers > ontwikkelingen in de wijk, specifieker inzoomen (Management: directie, Raad, B&W > abstract informatienvieau) Ze zouden hetzelfde moeten kunnen zien maar op een andere manier gevisualiseerd zodat het abstractieniveau opgehoogd kan worden.	Het management zal baat hebben bij een ondersteunend middel om te zien hoe het gesteld is met de huidige situatie en hoe bepaalde trends zich ontwikkelen.
Vragen binnen het sociaal domein	Lokaliseren van bepaalde soorten problematiek en mensen. Voorzieningen moeten we ook in beeld krijgen. Is er een balans in de vraag en het aanbod? De effecten van het beleid. Als je een doel voor ogen hebt, wil je ook kunnen zien of dit behaald wordt. Werkt het beleid?	Waar zit wat gelokaliseerd? Huishoudsamenstelling Welke zorg wordt er gebruikt binnen bepaalde wijken? Waar zit welke problematiek in Zaanstad? Bekijken of mensen meer en langer zelf iets kunnen doen. Preventief werken: je kunt nu al bepaalde	De bevolkingsopbouw kan bijvoorbeeld veel inzicht geven in de huidige situatie. Geo-informatie kan dingen inzichtelijk maken en makkelijk uitleggen. Het draagt bij aan de algemene beeldvorming. Ook de analyse mogelijkheid, je krijgt dingen in beeld die je eerst niet in beeld had. Dingen visueel maken zorgt er ook voor dat je het beter in beeld kunt brengen. Leeftijdsopbouw binnen de gemeente, en dan weergegeven per wijk. Dit om zo de hulpbehoevendheid te kunnen

		dingen constateren als er een problematiek heerst in een wijk. Verhoogd risico. Efficiëntere manieren om om te gaan met tekorten. Bijvoorbeeld het tekort aan huishoudhulp oplossen d.m.v. moeders die kinderen naar school brengen daarna langs te laten gaan bij mensen voor 2 uurtjes poetswerk.	bepalen. Ook de locatie van voorzieningen in beeld krijgen. Dit zijn hele basale vragen, maar die hebben we nu geen beeld van.
Hoe is de applicatie ingericht? Wat is er te zien en wat zijn de opties?	NVT	De applicatie is gemaakt met Clickview, waarbij er verschillende tabbladen zijn voor verschillende uitgangspunten/doelgroepen. Bijvoorbeeld de sociale wijkteams kunnen zelf bekijken wat voor soort 'cases' ze hebben gehad (zwaar, mddelmatig of licht). Het aantal cases wordt getoond, welke wijk etc. De geografische kant van het dashboard heb ik niet kunnen zien, hij had hier niet zo maar toegang tot.	NVT
Moeilijkheden voor de implementatie of binnen het sociaal domein	De techniek zal het probleem niet zijn. Data beschikbaarheid is soms een probleem, het is de vraag of data vanuit het sociaal domein te koppelen is aan een locatie.	Vragen scherp krijgen waar je echt op zou willen en ook kunnen sturen. Je moet wel oplossingen hebben voor iets wat je constateert en stuurt. Defintie van bepaalde begrippen. Wat is een kwetsbare groep? Wat is zelfredzaamheid? Welke informatie is daarvoor nodig. Opstellen van de indicatoren.	Het heeft op het moment niet de prioriteit. Er zijn veel andere dingen die moeten gebeuren en daarom schiet deze insteek er wel eens bij in. Het bewerkelijke van de data die er bij komt kijken is ook een moeilijk punt. Het koppelen van alle tabellen en data is heel bewerkelijk. De techniek hierbij kost veel tijd.

			Het scherp krijgen van de indicatoren: omdat we nu in een transitie zitten is dit erg lastig.
Data issues	Data is vaak niet eenduidig, adressen zijn soms niet relateerbaar conform de BAG. Locaties zijn ook niet altijd helemaal duidelijk. Postcode huisnummer combinaties verschillen ook van elkaar.	GGD en GGZ vertrekken moeilijk gegevens. Huisartsen doen ook soms lastig. Het is heel organisatie afhankelijk. Jeugdzorg informatie is ook lastig. Om het dashboard te gebruiken voor toekomst perspectief is het om het moment lastig omdat je de informatie nu pas aan het opbouwen bent. Voorheen waren we nooit verantwoordelijk, en nu wel.	Wordt de informatie die we beschikbaar hebben überhaupt wel gebruikt? En dit met name voor de geo-informatie. Wat hebben we zelf in huis? Het bleek dat we best wat data en informatie zelf in huis hebben. Mensen weten het vaak niet te vinden. Wij hebben ooit een keuze gemaakt om buurt, wijk en kern 1 naam te geven. Hiermee is de data verarmt. Als je nu iets wil weten over een wijk, krijg je de informatie over een kern. We moeten het detailniveau weer terugbrengen. Het probleem zit niet in de data. Er is zoveel informatie dat als je daar een beetje mee speelt, het genoeg informatie oplevert om mee door te werken. Toch praat de verschillende data niet goed met elkaar. Dit ligt aan verschillende naamgevingen van adressen en straten etc.
Data structuur	Geo-data staat op één plek, maar verder is wel veel informatie verspreid. We kunnen hier nog wel wat winnen en verder stroomlijnen. Het is alleen nog een	Nog geen volledig datawarehouse. Trekken informatie uit de backofficesystemen en stoppen we tijdelijk een database.	Je hebt gestructureerde data en ongestructureerde data. De eerste kun je op een kaart plotten, de tweede vorm wordt wat lastiger. We hebben veel data,

	zoektocht hoe we dat doen.	Veel data komt voort uit keukentafel gesprekken en onze analyses van wijkprofielen (ook uit Factlab). Gegevens combineren we met huishoudsamenstelling of schuldgegevens etc. Wijkteams registreren informatie uit keukentafels. Opdracht en factuur: aanvragen en wat er geleverd wordt is bekend. Informatie van zorgverzekeraars en aanbieders is in deze fase nog niet nodig, pas later als je echt verder wilt onderzoeken. Applicaties en data zijn centraal geregeld waardoor het gemakkelijk is om overal data vandaan te halen. Het is niet zo dat alles per 'afdeling' geregeld is dus dit scheelt heel erg in de informatievoorzieing voor het dashboard. Natuurlijk heeft iedere afdeling een eigen databron, maar dit is centraal geregeld. Koppeling met systemen van sociaal domein met BAG, met GBA en belastingsinformatie: dan krijg je een heel goed beeld van de gezinssituaties. Trends willen we ook met behulp van CBS gaan analyseren.	en we hebben een centraal gegevensmagazijn. Bepaalde koppelingen zijn hierin al gemaakt. Dit zijn puur de simpele wat-is-waar vragen. Complexe query's zitten niet in het systeem. CBS heeft heel veel data en er moet gewoon iets zijn waarbij je de gewenste data aan kunt klikken wat dan zo gemakkelijk op de kaart wordt gezet. Je moet interacteren met de data. Waarstaatjegemeente.nl biedt ook heel veel informatie aan.
(omgang) privacy	Je kunt niet alles zomaar uit het GBA trekken en koppelen met alles. Privacy is hierbij wel een grote issue. Het moet niet te herleiden zijn naar een persoon. Grote aantallen met veel mensen in een wijk zijn	Kaarten met Wmo cliënten weergegeven met een ratio: een cirkel (vlek) geeft weer dat er een bepaald aantal klanten zitten in een straal van 500 meter. Intensie van de aanvraag.	Het is privacy gevoelige informatie. Je mag de gegevens alleen tonen als het relevant is. Ik heb nu puntjes op pandniveau en dat is eigenlijk een te hoog detailniveau.

	minder makkelijk te herleiden. Als het om een straat gaat, is het al veel sneller te herleiden. Het is voor mij een grijs gebied wat wel en niet mag in deze gevallen. Ondescheid maken in wie de informatie wel en niet mag zien.	Het is op pandniveau maar dat wordt met een ratio opgelost. Allemaal op BSN ingevoerd. Niet relateerbaar naar een huisnummer, lastig omdat er soms maar 1 in een straat is.	
Combinatie geo en het sociaal domein	Inzichtelijk maken van thema's. Waar staan de buurthuizen en welke voorzieningen zijn daar aanwezig? Waar is behoefte naar welke ondersteuning? Het lokaliseren van bepaalde problematiek. Wijkgericht aanpakken. De kaart helpt erbij om dit inzichtelijk te maken.	Dit is aangespoord vanuit het sociaal domein. Zij kwamen sterk met de vraag waar wat zit en hoe de wijkproblematiek gesitueerd is. Op deze manier kun je veel gerichter bekijken hoe het in Zaanstad verdeeld is en daar dus ook een aanpak op aanpassen. Bepaalde sociale wijkteams kunnen opgeleid of benaderd worden voor een bepaalde problematiek en niet ieder sociaal wijkteam hoeft dat door de gerichtere aanpak. Goed inzicht in geconcentreerde of bredere problematiek. Visualiseren van problematieken.	Je zou bij wijze van spreken alle data in een trechter van geo willen gooien waaruit dan nieuwe en interessante inzichten komen. Er moet een verbinding gemaakt worden tussen alle data die we in huis hebben en het geo-component. Dit is op het moment nog wel het lastigste punt.
Visualisatie	Je moet je afvragen of de kaart altijd meerwaarde heeft. De kaart moet alleen geïntegreerd worden wanneer het waarde toevoegd. Het moet geen doel op zich worden.	Gebruik van trendgrafieken (nu nog met punten omdat het te kort is om ze al aan elkaar te trekken, niet genoeg gegevens), staafdiagrammen met verschillende kleuren per balk, tabellen, spinnenweb diagrammen, metertjes/pijlertjes om te bekijken waar je zit t.o.v. het gestelde doel of norm. Bolletjes op postcode range van aanvragen.	Het visualiseren van data zorgt echt voor nieuwe inzichten en maakt het ook makkelijk om te presenteren. Kleuren en vlakken helpen heel goed om inzicht te krijgen. Het is wel persoonsgebonden, want de één vindt het wel handig om bepaalde visualisaties te hebben, en de ander niet.

Dashboards algemeen	NVT	We gebruiken dashboards om het effect te meten van wat wij geanalyseerd/geconstateerd hebben, wat we daarmee gedaan hebben, en wat het effect daar dan van is. Het effect per wijk is dan ook makkelijker te overzien.	NVT
Inrichting dashboard	Je moet kunnen zien of het beleid het gewenste effect heeft. Nemen het aantal meldingen voor 'dure' hulp bijvoorbeeld af? Dit heeft een duidelijk tijdsaspect. Deze moet je dan met elkaar combineren.	Dashboard wordt gemaakt met Clickview, en de locatiecomponent komt vanuit onze eigen geobrowser. Deze twee zijn gecombineerd. De kaart is een onderdeel van het dashboard. Hoeveel mensen komen er binnen en gaan eruit? Informatie voor sociale wijkteams. Wijkgerelateerd waar klanten zitten rond verschillende problematieken. Bedoeling is om er 1 dashboard van te maken met verschillen in informatieniveau en visualisaties. Voor de Raad willen we een online dashboard met belangrijke thema's. Geen mogelijkheid tot zelf selecties maken omdat gebruikers dan de draad snel kwijt raken.	Kleuren en vlakken maken snel iets duidelijk. Daarna wil ik zien waarom iets een dergelijke kleur heeft, en waarom het geval zo sterk van kleur is. Dus meer de analytische mogelijkheid komt daarna. Taartdiagrammen met kleuren geven heel veel inzicht. Dit wordt ook gebruikt voor het ziektekosten dashboard. Ik vind het heel inzichtelijk (Lia). Je wil in één flits iets zien, en daar verder in zoeken. Als je tabellen moet doorspitten, dan zie je het niet in één flits.
Overig		In de besluitvorming wordt heel weinig gebruik gemaakt van de locatiecomponent. Alles is gebasseerd op tekst. Dit terwijl een	De insteek om te beginnen met vragen wat iemand wil zien is misschien niet helemaal ideaal. Eigenlijk wil je gewoon

		kaartje zo veel meer kan zeggen dan 5 pagina's tekst. Gezin gaat naar sociaal wijkteam of jeugdteam, teams zitten in de wijken. Gemeente heeft aanbesteding gedaan voor die wijkteams. Wat voor typen zorg wordt er in de wijken geleverd: wijkprofielen (krachtwijken, hoger opgeleiden, jonge tweeverdieners). Keukentafel gesprekken resulteren in een opdracht voor Zaanstad > geformaliseerd. Welke problematiek speelt er? Wat zijn de dure gezinnen, combinaties van zorg. In welke delen van Zaanstad hebben vervoer binnen de Wmo? Zijn al in een vroeg stadium begonnen, vanaf 2014 hebben ze al taken geimplenteerd. Sinds een jaar zijn ze al bezig met het ontwikkelen van dit dashboard en aan het onderzoeken welke indicatoren inzicht genereren en waarop gestuurd kan worden.	beginnen met analyseren, en daar komt vast wel uit voor wat je wilt zien. Je zou willen spelen met de data om blinde vlekken in beeld te krijgen. Deze krijg je niet in beeld als je van te voren aan moet geven wat je vragen zijn. De beschikbaarheid van de data is niet het probleem. Het is meer de issue hoe je dit gaat gebruiken en hoe je deze hoeveelheid overzichtelijk en inzichtelijk maakt.

	Gemeente Schijndel	SSC de Kempen	Gemeente Velsen
Datum	26-05-2015	14-11-2014	10-06-2015
Geïnterviewde en functie	Silvy Horbach: coördinator GEO Carl van der Pol: informatievoorziening sociaal domein	Peter Duijve: projectleider/beleidsadviseur	Hans Blom: afdelingsmanager informatiemanagement Roel Reuvekamp: teamleider ruimtelijke informatie
Implementatie/applicatie	Schijndel Ontmoet: een soort zorg marktplaats. Bezig met een viewer waarin bepaalde zorginformatie gepresenteerd wordt (huisartsen etc.)	NVT	NVT
Uitgangspunt van implementatie	Veel vanuit het burgerperspectief. De burger moet kunnen zien wat er in de directe omgeving aangeboden wordt op het gebied van onder andere zorg	Inzicht, beleidskeuzes visualiseren en ondersteunen.	Een ondersteuning bieden aan het sociaal domein door geo-informatie te integreren. Dit heeft naar ons idee veel meerwaarde: nieuwe dingen worden zichtbaar.
Status van implementatie	Beginfase, eerste stap voor de viewer is gemaakt. Inrichting van de systemen, waarbij 9 juli alles in werking moet treden. Dit moet getest worden en dat kost best veel tijd. Begin gemaakt met een viewer die verschillende voorzieningen in beeld brengt voor de burger.	NVT	De eerste presentatie richting het management is gegeven om ze op deze manier te triggeren voor de integratie van geo-informatie in dit domein. We hebben voorbeelden laten zien van andere gemeenten wat er allemaal al mogelijk is en hoe dit toepasbaar zou zijn voor de gemeente Velsen.
Doelgroep	Burgers	Er zijn verschillende doelgroepen, er moet iemand zijn die informatie zoekt. Anders ga je weer aanbodgericht denken. Waar ligt de	Beleidsmakers

		vraag? Bestuurders of wethouders zoeken zelf niet echt informatie naar mijn inziens.	
Vragen binnen het sociaal domein	Binnen het budget blijven en klanttevredenheid. Dat zijn wel de twee voornaamste doelen binnen het sociaal domein.	Een analyse doen bijvoorbeeld met het verplaatsen van doktersposten. Dit zal opleveren dat bepaalde mensen dichterbij een dokterspost komen dan anderen. Hetzelfde voor buurthuizen. Wat is een acceptabele afstand. Wat gebeurt er als ik een buurthuis sluit? Wellicht bespaar ik daar op, maar levert het elders problemen op. Je presenteert statische data in de tijd. Keuzes en scenario's zijn wellicht een betere insteek dan gaan werken met echte voorspellingen. Het kan gevaarlijk zijn om deze insteek te pakken. Het moet altijd ondersteunend blijven, en niet het uitgangspunt. De ontwikkelingen zijn wel interessant om te bekijken, bepaalde momenten: hoe was het op 1 januari 2014 en op 1 januari 2015. Je zou snapshots van data willen hebben waarbij je je tijd vastlegt.	De insteek is om wijkinformatie te genereren en combinaties maken tussen verschillende data. Dit kan bijvoorbeeld de combinatie zijn tussen woningenaanpassingen en inkomen. Dit zegt gelijk iets over de toestand van deze persoon of wijk. Hoe mondig zijn bepaalde mensen in een wijk, en hoe is het gesteld met het inkomen? Een link in die sfeer kan inzicht geven over een wijk. Zo kun je de aandacht goed verdelen tussen de wijken. Je kunt aan zo veel dingen een locatie koppelen waardoor het ineens veel interessanter wordt. We willen ons focussen op de (financiële) doelstellingen die gesteld worden en of er geen situaties gecreëerd worden waarbij mensen buiten de boot vallen. Dit willen we voorkomen. De Raad en Wethouders zijn hier wel gevoelig voor.
Hoe is de applicatie ingericht? Wat is er te zien en wat zijn de opties?	Op het moment is er een online viewer (op basis van GoogleMaps) waarin voorzieningen zoals apotheken, huisartsen, tandartsen en sportvoorzieningen gepresenteerd	NVT	NVT

	worden.		
Moeilijkheden voor de implementatie of binnen het sociaal domein	De basis voor sturingsinformatie is niet aanwezig op het moment. Vaak ontbreken er belangrijke attributen in datasets wat er voor zorgt dat we geen compleet beeld krijgen.	De combinatie van verschillende datasets en beschikbaarheid/actualiteit van data. De data is momenteel erg bewerkelijk. Vraaggericht werken is ook lastig, het moet komen vanuit de aanbod kant: er moet informatie gezocht worden, en niet aangeboden zonder vraag.	De vakinhoudelijke mensen hebben nu geen idee wat het kan doen (de integratie van geo-informatie) en dadelijk als ze het eenmaal doorhebben vinden ze het raar dat een dergelijke combinatie nog niet aanwezig is. Dat willen wij voor zijn. Na de presentatie vonden ze het interessant, maar er is niets over gebleven aan deze kreten. Wij moeten het aan blijven zwengelen.
Data issues	Het ontbreken van data in zijn algemeenheid, missende attributen, geen sturingsinformatie. De basis ontbreekt gewoon. Er moet hier iemand tijd aan besteden om dit op orde te krijgen. De consulenten zijn hier eigenlijk verantwoordelijk voor: zij verzamelen gegevens aan de keukentafel. Toch gaat hier iets niet helemaal goed. We moeten ook nog steeds afspreken wat er wel en niet geregistreerd moet worden. We moeten onderscheid maken tussen WAT data en DAT data. We hoeven in sommige gevallen alleen te weten *dat* iemand een bepaalde indicatie heeft, en niet wat voor specificaties. Gegevens zijn echter wel de hulpmiddelen binnen de decentralisaties.	Data is vaak niet optimaal gestructureerd. Systemen zijn voortgebouwd op andere oudere systemen. Analyses kunnen niet uitgevoerd worden door onjuistheden en dubbelheden. Je moet heel goed weten wat voor data er in een bepaald systeem zit, waar deze gelokaliseerd is en of de data actueel is. Daar lopen wij heel vaak tegenaan. Dit heb je vaak als je basisregistraties aan elkaar koppelt. De verschillen opschonen is jaren werk. Voor de actualiteit van het dashboard geldt ook dat de dataset bijgehouden moet worden. Als je dit voor zorg wil hebben, kun je een mooie actuele BAG hebben, maar kan het nog zijn dat de zorg-data niet actueel is. Zorgaanbieders kunnen ook steeds van	Het zal, ongeacht de oplosbare privacy issues, nog wel een hele slag zijn om alle gegevens te krijgen die we zouden willen hebben. Ik ben nu via de politiek aan het proberen om de problematiek omtrent dit vraagstuk op te lossen. De jeugdzorg informatie is moeilijk te verkrijgen, terwijl dit een essentieel onderdeel is. Je moet goed uitleggen wat het belang is dat deze data beschikbaar is. Het belang moet wederzijds zijn. Je kunt het ook bekijken vanuit de data die wel beschikbaar is: wat hebben we wel en dan gebruiken we dit als basis.

		naam veranderen. Het moet eenduidig en actueel zijn anders zijn het onbetrouwbare presentaties.	
Data structuur	We zijn de laatste tijd druk bezig geweest met het op orde brengen van gegevens en systemen. Bepaalde applicaties worden ingericht om de gegevens te ordenen. Deze moeten op 9 juli operationeel zijn.	NVT	We hebben Velsen in Cijfers, waarbij we aan het kijken zijn welke data wie hieruit kunnen halen. Onze contractpartners hebben ook veel gegevens, en daarbij komt wel privacy om de hoek kijken. Dit zie ik alleen niet als issue. Velsen in Cijfers werkt heel gemakkelijk, je kunt alles gemakkelijk selecteren en opvragen en er is ook een combinatie met CBS gemaakt.
(omgang) privacy	We hebben met bepaalde partijen met betrekking tot informatie wel goed contact, maar merken dat bepaalde huisartsen wel op zichzelf zijn wat betreft gegevensuitwisseling. Onderscheid tussen DAT en WAT informatie. Dus meer specificaties onder de WAT informatie en puur informatie dat iemand een indicatie heeft moet onder de DAT informatie vallen. Zo omzeil je een beetje de privacy issues.	NVT	Privacy is geen issue want je moet gewoon de gegevens aggregeren zodat ze niet meer herleidbaar zijn tot een persoon. Als je dingen anonimiseert kun je het zo goed gebruiken als beleidsondersteunend middel. Het belang moet hier alleen nog van ingezien worden. Er moeten ook grenzen opgezocht worden. Tot hoe ver kun je gaan? Ook verschillende informatieniveaus. Gradaties in informatie. De één mag meer dan de ander.
Combinatie geo en het sociaal domein	Voor ons dorp Schijndel is het niet zo spetterend om te onderzoeken hoe de	NVT	Er moet een GIS-tool ontwikkeld worden als beleidsondersteunende tool. Mensen mogen

	situatie per wijk is. Het is niet zo spannend. En daarnaast weten we veel al wel hoe het allemaal zit. Wat interessant is, is de fusie waar we op het moment mee bezig zijn (Veghel, Sint Oedenrode en Schijndel worden gefuseerd). Het is dan interessant om te zien hoe het in verhoudingen gesitueerd is: waar zitten welke voorzieningen en waar ligt de nadruk op bepaalde soorten problematiek? Door de fusie praten we over zo'n 80.000 inwoners.		niet buiten de boot vallen en dit wil ik proberen te ondersteunen met een GIS-tool. Dit zal ook mijn argument zijn ten opzichte van de Raad en de wethouders. Het wordt aangestuurd door de afdeling Informatie Management. Aanbod genereert ook vraag. De GIS-tool moet ook een analytische mogelijkheid hebben om bijvoorbeeld uit te zoeken waar je het best een speeltuin kunt plaatsen. Dit kun je niet uit een lijst halen. Dit moet je met GIS doen. We bereiden thema's voor, en deze kunnen mensen gebruiken voor welke reden dan ook.
Visualisatie	NVT	Aan de hand van foto's of presentaties van verschijnselen het budget koppelen: iets slecht onderhouden kost weinig geld, maar ziet er slecht uit. Als je meer geld uitgeeft, is er ook een mooiere foto van het verschijnsel te zien bijvoorbeeld. Interactief spelen met het dashboard en met de begroting om zo keuzes te kunnen maken in beleid. Wat is de consequentie van de keuze.	Een plaatje zegt meer dan 1000 woorden.
Dashboards algemeen	NVT	Op welke indicatoren moet er gestuurd worden? Dit is belangrijk om te zien. Het is belangrijk om te kiezen of er statische of dynamische gegevens gepresenteerd worden. Bijvoorbeeld ontwikkelingen in de tijd kunnen interessant zijn. Dynamische	Een dashboard kan voor heel veel mensen interessant zijn, maar je moet wel goed voor ogen hebben voor wie dit dashboard ontwikkeld zal worden. Waar wil je het voor gebruiken? Puur voor strategisch niveau, of is het slechts voor de bestuurders. Voor

		dashboard zijn momenteel wel ambitieus naar mijn idee.	bestuurders zal het minder interessant zijn, maar voor beleidsmensen en programmamensen zal het zeker meerwaarde hebben.
Inrichting dashboard	NVT	Onderhoudskaarten kunnen inzicht geven in wat er het aankomende jaar gedaan wordt binnen de gemeente. Dit is een soort beleidsvoorname en beleidsverantwoording in één. Het geeft zicht op de begroting. Het zal nog wel even duren voordat dit mogelijk is.	Wat er op het dashboard gepresenteerd moet worden moet je goed overleggen met de eindgebruikers hiervan. Wij moeten dan sturen wat deze mensen zouden willen zien. Goed overleggen wat er wel en niet geïntegreerd wordt.
Overig	Het is vaak het geval dat er mooie tools voor handen zijn, maar dat ze daarna niet meer gebruikt worden. De vraag is dan uiteindelijk te klein. Het is een beetje hetzelfde als een mooie Ferrari in de garage hebben, en er vervolgens niet mee gaan rijden.		