Public Value of Smart City Development in Amsterdam and Hamburg

Master thesis submitted to Delft University of Technology

in partial fulfilment of the requirements for the degree of

MASTER OF SCIENCE

in **Engineering & Policy Analysis**

Faculty of Technology, Policy and Management

by

ing. Daniël J.E. Borsje

Student number: 4510887

To be defended in public on September 21st 2018

Graduation committee

- Chairperson : Prof. dr. W.M. (Martin) de Jong; Organisation and Governance
- First Supervisor : Dr. T. (Thomas) Hoppe; Organisation and Governance
- Second Supervisor : Dr. G. (Geerten) van de Kaa; Economics of Technology and Innovation

"Talent unlocks the door.
Skill opens it.
Hard work keeps it from slamming in your face."

- Tim Grover

Acknowledgement

This document is a Master Thesis research project as the final part of the Master Programme 'Engineering & Policy Analysis' of the faculty of 'Technology, Policy and, Management' at Delft University of Technology.
The programme was challenging and required me to perform at the best of my abilities. It tested me not only on the intellectual level, but also on dealing with uncertainty and stress. Therefore, I am grateful and proud to finish this programme and to present my Master Thesis research to you in this report.

Special thanks to my graduation committee for supporting me during the process of this research and for providing the feedback that significantly improved the quality of this report. I also want to thank my family and friends for the unconditional love, support, and help they offered in the moments I could not do it alone. This allowed me to perform at the best of my ability both physically and mentally.
Last but not least, I want to thank all the participants for my research. They form the core of this study, which means that this would not be possible without their willingness to spend an hour of their valuable time to help me with this research. Also, the hospitality in their offices both in Amsterdam and Hamburg is genuinely appreciated. It brought me to interesting new places with valuable experiences attached to them.

Abstract

The study presented in this document is a Master Thesis research project performed at Delft University of Technology. The main topic of this research is the development of the Smart City, which is a label in the field of City branding as part of the research field of Urban development and Political sciences. The Smart City is for this research defined as 'a city where information and communication systems are used to collect data that can help with improving the quality of life in the city'. The goal of this research in to better understand the different implementation strategies for the Smart City concept. Since the Smart City concept is interpreted in many different ways, different cities around the world implement the concept in completely different ways. An article by Raven *et al.* (2017) shows these differences when comparing the Smart Cities of Amsterdam, Hamburg, and Ningbo. The article describes the cities based on regulative, normative, and cognitive elements, which resulted in three different approaches for implementing the Smart City concept. In an attempt to find an explanation for the different approaches, this research builds on the article by Raven *et al.* (2017) by focussing on the normative elements of the Smart City. More specifically, this research will focus on the Public values in Smart City development in Amsterdam and Hamburg. The main research question for this study is: "What Public values influence decision-making for Smart City implementation, *based on the Amsterdam and Hamburg examples*?"

The concept of Public value has been subject of many research, which lead to ambiguity on the exact definition of the term. The working definition for Public value in this research is: "*Public value is the positive effect on social welfare for the citizens or society created by specifically focused public policy*". And as a more specific definition, Public value in Smart City development is defined as: "*The added value that is created for the citizens or society by the Smart City initiatives and projects".*

To answer the research questions, two main theoretical concepts are used. One for mapping Public value and one for analysing the decision-making process. The first concept is the public value landscape by Meynhardt (2009). This concept combines other theoretical concepts to create a schematic representation of core Public values divided over four dimensions. The four dimensions are: (1) Moral-ethical, (2) Hedonistic-esthetical, (3) Political-social, and (4) Utilitarian-Instrumental. This landscape allows to categorize Public values, which structures the analysis.

The second concept is the idea of Discourse Coalitions by Hajer (1993). This concept describes political discourse as an arena where all actors have their own perspective of the problem. Actors with the same perspective will form a coalition and work together towards a common goal (both intentional and unintentional). A research method designed to find different perspectives, is the Q-methodology. The Q-method is a conceptual research framework that combines qualitative and quantitative data collected from interviews. This study is conducted according to this method for its ability to extract perspectives in a multi-actor situation. It also allows to translate an abstract topic, like public value, to every-day situation that are familiar to respondents. The research method starts with creation a list of statements about the subject. For this research, a list of 24 statements is created based on quotes found in a discourse analysis. All these statements represent a specific Public value from the landscape. In the next step of the method, an actor analysis is performed for both cities. This results in a list of dedicated actors, which can potentially be respondents for the study. Twelve of these potential actors are interviewed qualitatively, seven in Amsterdam and five in Hamburg.

Analysis of the twelve interviews resulted in the formulation of three different perspectives of Public value in the Smart City. These perspectives are: Factor 1: “Creating Smart Citizens, not a Smart City”, which is mainly focussing on the political-social dimension of Public value with values like citizen involvement and social innovation as main drivers, Factor 2: “Sustainability as a key driver”, which is mainly focussing on the utilitarian-instrumental dimension of Public value with values like sustainability and robustness as main drivers, and Factor 3: “No acceleration without trust”, which is mainly focussing on the moral-ethical dimension of Public value, with the value integrity as main driver. These three perspectives and their Public values attached to them form the answer to the main research question.

The results of this research provide an understanding of perspectives on the Smart City by its involved actors, based on Public value. Knowledge about these perspectives can be used to specifically target certain values and with that create policy and projects that are much more effective. Any Smart City can expect to have actors that share at least one of the three perspectives of Public value in the Smart City presented in this research. Consequently, awareness of these perspectives can allow for a better and faster understanding of the Public values that are important to the actors in the Smart City.
The scientific contribution of this research focusses on finding a way to determine the Public values that are considered important in a Smart City, and how these Public values can be used to explain are predict decision-making. The qualitative research conducted in this study evaluated the importance of certain Public values in the decision-making for Smart City development. This is the first time that Public values are empirically connected to Smart City development. This research also contributes to the general understanding of Public values. The translation of values to case-specific statements allows to see the abstract values in a specific example and also allows participants to easily identify themselves with the values.

Table of Content

List of Figures and Tables

List of Figures

List of Tables

List of acronyms

AMA	Amsterdam Metropolitan Area
AMS	Amsterdam
ASC	Amsterdam Smart City
CDL	Citizen Data Lab
DE	Germany
EV	Eigenvalue
HAM	Hamburg
HAW	Hamburg University of Applied Sciences
Hamburg	Free and Hanseatic City of Hamburg
HCU	HafenCity University
HPA	Hamburg Port Authority
HvA	Hogeschool van Amsterdam; Amsterdam University of Applied Sciences
ICT	Information and Communication Technology
IoT	Internet of Things
MoU	Memorandum of Understanding
NL	The Netherlands
PCA	Principal component analysis
PV	Public value
PVM	Public value Mapping
RQ	Main research question
SD	Standard deviation
SE_r	Standard error
SC	Smart City
SQ	Sub research questions
TUHH	Hamburg University of Technology
UvA	University of Amsterdam
VU	Vrije Universiteit Amsterdam

1. Problem Introduction

The research presented in this report is focussed on the field of City Branding, in particular the Smart City label. This first chapter introduces the problem being studied. It contains background information about City Branding and the Smart City concept, the problem formulation, the research objective, the scientific relevance of this research, the scope, and the research questions. The last part of this chapter is a reading guide for this report.

1.1. Background

In recent years, many cities around the world have started to use City Branding in an attempt to attract people and firms in their target groups. This research will focus on the specific city label 'Smart City'. In this section, both terms are elaborated based on scientific research in this field of interest.

1.1.1. What is City Branding?

The term City Branding is a topic of many scientific contributions over the last years (e.g. Braun et al., 2017; de Jong, et al., 2018; Han, et al. 2018; Molina, et al., 2017). Although there is slight ambiguity on the exact definition of the term, all studies define City Branding somewhat around the general description by Molina *et al.* (2017). They define City Branding as: "City Branding refers to the study and management of brands representing cities and encompasses the study of several concepts linked to branding" (p.28). A more practical interpretation is given by Goess, de Jong, & Meijers (2016), where they state that "City Branding is an important tool for cities to lure new investors, businesses and inhabitants" (p.2047). A combination of both is given in recent work from Han *et al.* (2018), where City Branding is described according to its purpose as: "In the drive to attract investors, businesses, talented workforce and profusely spending visitors, local governments around the world go to great lengths to convey positive self-images to the outside world and hope to obtain a variety of economic returns in exchange" (p.1). In general, City Branding is used by cities to distinguishes themselves from other cities in a developing world with urbanisation and an increasing importance of technology.

Recent research into City Branding has focused mainly on 'subjective' aspects, such as city identity and city image, the historical evolution of City Branding, branding strategies and tactics and the importance of stakeholder engagement (de Jong, et al., 2018. P.528). This last aspect, the importance of stakeholder engagement, especially triggered multiple studies (e.g. Braun, et al., 2017; Han, et al., 2018). Braun, *et al.* (2017) have built the definition of City Branding (or is this case called place branding) around the importance of stakeholders in their contribution "Improving place reputation: Do an open place brand process and an identity image match pay off?". They define place branding as: "a demanding governance process involving many stakeholders and characterized by cognitive complexity, with stakeholders holding different views of the brand and emphasizing different aspects of a place" (p.6). Braun *et al.* (2017) emphasize the importance of stakeholders by giving two reasons why city governments cannot brand places on their own. First, because they lack the resources to do all brand development and communication. Second, because the place brand depends not only on governmental actions and communications, but also and especially on the actions and communication of the place's private organizations, societal organizations, residents and visitors (p.499). Han *et al.* (2018) add that "for City Branding to be credible and successful, it is imperative that stakeholders relevant to its implementation support it and communicate the same message to the outside world" (p.22). The definition of City Branding used for this research is: "The study of naming or labelling a city to attract a specific group of investors, businesses, or citizens".

1.1.2. The Smart City concept

City Branding is used in many different fields and practices. One of them is the field of Information and Communication Technology (ICT) where cities claim to use technological developments to achieve their objectives. This City Branding label is referred to as the Smart City. Generally, the Smart City is the city that seeks to achieve the objectives of a future city by utilizing ICT solutions and trends (Mohammed, et al., 2014, p.267). Although this definition by Mohammed, *et al.* (2014) is comprehensive, it is not the only or commonly agreed definition for the Smart City label. Washburn *et al.* (2010) define the Smart City from a more technology based point of view as "The use of Smart Computing technologies to make the critical infrastructure components and services of a city — which include city administration, education, healthcare, public safety, real estate, transportation, and utilities — more intelligent, interconnected, and efficient" (p.2). An article by Shi *et al.* (2017) even implies that the Smart City is the only solution for urban development challenges with the statement: "From the perspective of the evolution logic of the urban system, a Smart City is the only solution to the problems and contradictions that have become increasingly intensified in the process of urban development" (p.14). A more economic point of view is given in a professional contribution by Van Dijk *et al.* (2015), who state that "a city is smart when investments in (i) human and social capital, (ii) traditional infrastructure and (iii) disruptive technologies fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (p.15).
A popular definition of the Smart City comes from the field of Urban Development. The challenges the Smart City tries to solve are in this view mostly due to the urbanization of the recent years. Overpopulated cities are facing several problems in areas as health care, emergency responses and public safety. Mohammed *et al.* (2014) list the challenges which will affect the development and sustainability of growing cities during the coming decades as "the rapidly increasing populations; urbanization; the environmental emissions and the sustainability requirements; and the global economy instability" (p.269). A solution adopted by many cities to face these challenges [such as city administration, education, health care, public safety, transportation, utilities, etc.] is the realization of the Smart City concept (Mendonça, et al., 2016, p.1).

It is clear that a Smart City can be defined in different ways, depending on the perspective of the viewer. In this research, the Smart City will be defined in quite general terms as:

A Smart City is a city where information and communication systems are used to collect data that can help improve the quality of life in the city.

This definition does not imply that the Smart City should be used to solve urban challenges. However, policy makers can use the gathered information from this definition for solving urban challenges like traffic control or waste management.

1.1.3. Implementation of the Smart City concept

As already became clear in the previous section, the Smart City concept can be interpreted in many different ways depending on the perspective of the initiators. Therefore, cities around the world implement the Smart City concept in a way that fit their own goals best. As a result, multiple different approaches are created to implement the same concept, all with the goal to improve the living quality of the city. The paper "Urban experimentation and institutional arrangements" by Raven *et al.* (2017) show how the cities of Amsterdam, Hamburg, and Ningbo implement the Smart City concept. These three cities already show completely different approaches. Examples are the 'polder-model' in the Netherlands, the strong role of states and municipal governments in Germany and the top-down style and the omnipresent presence of the national political machinery in China (Raven, et al., 2017, p.20). Other cities around the world are likely to implement the same concept is an even bigger variety of ways, according to their organization of politics and business.
What most of the recent Smart City implementations have in common, is that they emerge according to the triple helix concept. The triple helix concept interprets the shift from a dominating industry-government dyad in the Industrial Society to a growing triadic relationship between university-industry-government in the Knowledge Society (Dameri, Negre, & Rosenthal-Sabroux, 2016, p.2974). All Smart Cities focus on improving the collaboration between the three factors (knowledge institutes, industries, and government), in an attempt to combine the knowledge and strengths to solve the urban challenges.

The process of becoming a Smart City takes time and requires effort and patience from all actors involved. The maturity of the Smart City depends on the position it has in this development process. A professional contribution by Van Dijk *et al.* (2015) presents a framework for measuring the maturity of the Smart City. They distinguish the following four stages of Smart City development: (1) "Initial", (2) "Intentional", (3) "Integral", and (4) "Transformed". The report defines all four stages using typical characteristics in the following eight domains of their capability model: Strategy & Vision, Projects & Solutions, Data, Technology, Skills & Competences, Attractiveness, Openness, and Ecosystems. Appendix I shows the table with the characteristics for the eight domains in every stage of development. This table is fully based on Van Dijk *et al.* (2015).

1.1.4. Specific Smart City descriptions

This section takes a closer look at the organisation of the Smart Cities of Amsterdam and Hamburg, to create a better understanding of the implementation of the concept. The description of the regulative, normative, and cognitive elements of the implementation provided by Raven *et al.* (2017) are used as starting points. The goal of these descriptions is to gain a better understanding of the Smart City concept by providing two different examples of Smart City implementations. The descriptions also include some geographical data that serves as context setting information.
The specific Smart Cities of Amsterdam and Hamburg are described because this research will focus on these two cities, as a follow-up study for the article by Raven *et al.* (2017). The decision for these two cities is motivated in further parts of this chapter.

The Smart City of Amsterdam

Amsterdam is the capital of The Netherlands, located in the western part of the country in the province Noord-Holland. The population of the city of Amsterdam is around 850,000 (CBS, 2018) and is part of the Amsterdam Metropolitan Area with over two million citizens. The city is well-known for its tolerant and liberal character. Whereas most Dutch cities fine-tune their Smart City strategies, rhetoric and experimentation in relation to regional clusters such as healthy urban living (Utrecht), security (The Hague), port industry (Rotterdam) and high-tech knowledge industry (Eindhoven), Amsterdam does not have a clear-cut profile in terms of economic specialization or industrial clustering (Raven, et al., 2017, p.7). The Smart City of Amsterdam is a product of the traditional characteristics of the city. Amsterdam presents itself to the world as a citizen-driven Smart City with little central steering, which could be characterized as a type of bottom-up Smart City (as opposed to a control room centred, government-driven Smart City) (Raven, et al., 2017, p.7). This unique approach earned Amsterdam the title *European Capital of Innovation 2016* (European Commission, 2016) and gave The Netherlands an increasingly high ranking in the Global Innovation Index over the past years, with a second place in the latest ranking (Dutta, et al., 2018).

The Smart City of Amsterdam is built around a social platform called the Amsterdam Smart City platform (ASC), which supports and facilitates new Smart City projects by creating a collaboration between public and private organisations. It is tasked with promoting economic development, with contributing to technological and social innovation relevant to tackle a range of urban problems and – most important – with facilitating Smart City experimentation in the Amsterdam Metropolitan Area (Raven, et al., 2017, p.8). Since 2009, ASC has developed into a platform with over 150 project partners active in more than 100 innovative projects across several themes, including energy, mobility, and circular economy (Van Winden, et al., 2016, p.19). Two things are unique about experimentation in Amsterdam: (1) the large and fragmented amount of very-small scale pilot projects; (2) the governance arrangement of the ASC platform that facilitates a peculiar but productive relationship between urban government and corporate stakeholders (Raven, et al., 2017, p.7). The bottom-up approach in combination with the unique characteristics mentioned above make the ASC platform a Public Private Partnership (PPP).
Branding Amsterdam to the outside world as a 'bottom-up' Smart City helps to create an image of the city as a highly dynamic innovation eco-system where entrepreneurship is rewarded and where a range of smaller and bigger companies as well as a pro-active and facilitating government can find one another easily (in this storyline bottom-up does not necessarily mean citizens, but lack of government steering in favour of more entrepreneurial freedom) (Raven, et al., 2017, p.10).

The normative elements of the Smart City of Amsterdam are mostly visible in the way the experiments or projects are organized and executed. The traditional open and tolerant character of the City is represented in the informal way of organisation and execution. The relations are built around trust and the focus on an equal set of values. Raven *et al.* (2017) describe the set of values, including addressing societal challenges such as sustainability (very explicitly) and promoting active citizenship and social inclusion (mostly implicitly). They also add that other implicit values have to do with ideas about the guiding role of the government in supporting innovation and development.

The Smart City of Hamburg

Hamburg, officially named the *Free and Hanseatic City of Hamburg,* is a city located in the North of Germany. With a population of over 1.7 million (Geonames, 2018), Hamburg is the second largest city of Germany, only topped by the nation's capital, Berlin. The strategic position along the Elbe river and close to the North Sea allowed for great economic development and made the port of Hamburg the largest in Germany and the third largest in Europe, after Rotterdam and Antwerp. The city has traditionally been characterized as a particularly open, internationally visible one, and the current administration sees it competing with Shanghai and Sydney to be one of the most attractive, innovative and liveable cities by the sea (Raven, et al., 2017, p.11).

Since 2014, Hamburg has been presented in some particularly pronounced statements of the lord mayor and the mayor for economic affairs as being on the way to becoming Germany's primary Smart City (Raven, et al., 2017, p.13). The concept of Smart City includes the idea of digitally enhancing the habitat "City" in order to benefit its citizens (City of Hamburg, 2017, p.4). The city is aiming to shift the focus from the traditional trading character towards a more innovation led environment driven by digitalization. This process was initiated by a Memorandum of Understanding (MoU) signed by both Cisco and the City of Hamburg (2014). In this MoU, the main goal is "Building on the Internet of Everything and innovative technologies, Hamburg aims to improve the quality of life for its residents by enabling greater mobility, efficiency, safety and sustainability" (Cisco, 2014). The partnership between Cisco and the City of Hamburg led to several projects and experiments in the city towards digitalization. Currently, the two largest Smart City, or Digitalization, projects in the City of Hamburg are the development of the HafenCity, which is Europe's largest inner-city development project (HafenCity Hamburg, n.d.), and the smartPort project that is aiming to create an intelligent port.

The normative elements in the Smart City of Hamburg are described by Raven *et al.* (2017) as the role of the government. Where the municipality is responsible for ensuring that the public interest (like data safety) is sufficiently considered in all public–private partnerships. The supervising role of the government is ensured by initiating the largest projects with state-led organisations (like HafenCity GmbH and Hamburg Port Authority). The shaping of Smart City experiments for Hamburg consequently happens in closed circles of experts usually without the public or external experts being given a voice (Raven, et al., 2017, p.13). Therefore, the focus of these projects is more on creating economic viability than on the actual improvement of the quality of life for the citizens. An experiment which (in 2016) invited Hamburg's citizens to engage in a participatory exercise of 'finding places' for refugees (with the help of MIT's visualization technology 'CityScope') may indicate that a discrepancy between the (new) rhetoric of people centeredness on the one hand and the largely technology-focused pilot projects developed before may have been problematized at this stage (Raven, et al., 2017, p.13). However, the citizen involvement in creating public policy is still very limited.

1.1.5. Effectiveness of Smart City implementations

Little is known about how effective the Smart City really is against the challenges it is designed to face. The paper by Raven *et al.* (2017) does evaluate the implementations by asking how and why Smart City experimentation differ across urban contexts. The article explores and compares emerging institutional arrangements across three cases (Amsterdam, Hamburg, and Ningbo). The main focus is on the regulative, normative, and cognitive elements of the implementation. The study suggests that "there are place-specificities at play, including national characteristics, such as national governance styles and policy programs" (p.20). The article concludes that "individual cities in each of these nations (The Netherlands, Germany, and China) obviously do not operate all in exactly the same way and it is reasonable to expect that the variety of institutional arrangements far exceeds those of the three cities under study in this contribution" (p.21).

1.2.Problem formulation

The previous sections show that there is a clear difference in implementation strategy between the Smart Cities of Amsterdam and Hamburg. The normative elements of both cities also show clear differences, which suggests that the differences in Smart City implementation are partly derived from the differences in value. This research will take a closer look at the normative elements as a possible explanation for the differences in implementation. More specifically, finding the role of Public value in Smart City development and finding the specific Public values that are considered important for the decision-makers in the Smart City. The role of Public value in these normative elements is explained in the next chapter (2.1 The normative elements in Smart City development).
The human factor of the Smart City, which is mostly described with the normative elements, is expected to be different in every country, since every country and even every city has its own (culture-based) moral opinion about the "quality of life". This study will attempt to find the role of Public values in Smart City development, and find out if this difference can be the motivation for the different approaches found in different cities. It is important to find the role of Public values in the Smart City first, because it isn't necessarily true that there is a clear picture of the importance of Public value in the development. Or as Chouradi *et al.* (2012) put it, "Addressing the topic of people and communities as part of the smart cities is critical, and traditionally has been neglected on the expense of understanding more technological and policy aspects of smart cities" (p.2293). The values in this process have not been studied yet, which leaves a knowledge gap.

1.3. Research objective

The goal of this research is to fill the knowledge gap by identifying the role of Public values in the Smart City development, and to determine if the differences in Public values cause the differences in Smart City implementations. This will be achieved by finding the Public values that are important to decision-makers and other important actors in the Smart Cities of Amsterdam and Hamburg, and by determining the Smart City implementations it affects. The results of this research can be used by Smart City initiators to make sure their projects or experiments match the desires of the public and other partners. By doing so, the projects can be much more efficient and effective.

1.4.Scientific relevance

This research will mainly contribute to the scientific understanding of the Smart City implementations, which is a practical issue in the field of City Branding and Political Sciences. It will add the position of Public values in the initiation of projects and in governmental decision making. It will also examine the possible explanatory power of Public value in Smart City development; to see if a Smart City strategy can be expected (or suggested) based on the Public values that are central in that city. The use of Public values in this context will also add to the basic understanding of Public value and the way it can be used to explain decision-making. This will contribute to the social science field of Public values by using the values to explain certain decision-making, instead of only focussing on the effect of policy on the Public values.
This study also tries to find a specific research-methodology that is particularly well fit for researching values in city-development. Since these values have not been studied, little is known about the research-methodologies that can be effective in this field. This research will use a method and evaluate its capability of achieving the research objectives.

1.5. Scope

This research will mainly focus on the Public values as a possible explanation for the differences in Smart City implementation. The cities that will be evaluated in the case study are Amsterdam and Hamburg. These two cities are selected because the public-private-partnership that drives the Smart City in Amsterdam creates an interesting playfield and Hamburg is a much more state-led structure that gives a completely different perspective. Also, the formal and strict nature of the German culture predict a completely different view of how to build a Smart City and how to properly address the Public value, compared to the open and tolerant character of Amsterdam. These cities are also under study in the article by Raven *et al.* (2017), the article the study builds upon. The Smart City of Ningbo, the third city studied by Raven *et al.*, will not be studied in this research due to time and budget constraints.

1.6. Research Questions

The solution for the problems defined in the section above will be found by answering a set of research questions. These questions help to structure the line of reasoning and help to clarify the process of this research. One main research question (RQ) is formulated, followed by a set of sub-questions (SQ). The answers to these sub-questions will together lead towards the answer of the main research question.

The main research question for this study is:

- RQ. What Public values are used in decision-making for Smart City implementation, based on the Amsterdam and Hamburg examples?

The main research question is answered in chapter 8 Conclusions & Discussion.

1.6.1. First sub-question

The first sub-question is a theoretical framework on Public values. The goal of this research question is to define Public value and explicate the use of this term in Smart City development. The first part will define Public value in general. The second part evaluates how the Public values are displayed in the Smart Cities around the world and how they can be measured. The last part states a list of statements for political discourse, that display different Public values bound to Smart City development and projects. In summary, the first sub-questions are:

- SQ1. What Public values can influence the Smart City Implementation?
    - SQ1.1 What are Public values?
    - SQ1.2 How can Public values be measured in Smart City development?
    - SQ1.3 What explicit Public value statements are made in the discourse about Smart City development?

Sub-question one is answered in the Chapters 2 and 4.

1.6.2. Second sub-question

The second sub-question is about the actors involved. The goal of this research question is to find the dedicated actors in the Smart Cities of Amsterdam and Hamburg, where a dedicated actor is an actor that is actively involved in the decision-making progress and willing to use their resources to achieve their goals. Finding these actors allows to better understanding the decision-making process in the Smart City and creates a list of potential interview-participants. The second sub-questions are:

- SQ2. Who are the dedicated actors in the Smart City development?
    - SQ2.1 Who are the dedicated actors in the Smart City of Amsterdam?
    - SQ2.2 Who are the dedicated actors in the Smart City of Hamburg?

Sub-question two is answered in Chapter 5.

1.6.1. Third sub-question

The answer to the third sub-question is the result of the analysis. The goal of this research question is to find different perspectives among actor in the two cities. This research question uses the understanding of Public value from SQ1 and the actors from SQ2 to formulate different perspectives of the Smart City, based on Public value. Formulating different perspectives allows to narrow down all separate opinions, based on common understanding of the values. The third sub-question is:

- SQ3. What are the different perspectives of Public values in Smart City decision-making?

Sub-question three is answered in Chapter 7.

1.7.Reading guide

From this point forward, the research questions are answered in a chorological way towards the conclusions. Chapter 3 presents the methods used to find the answer to the research questions. This chapter also includes the motivation for the methods and subjective choices made within the method. This motivation will not be repeated when applying the methods.
The chapters dedicated to answering the research question are mentioned in the previous section. Each chapter will end with a conclusion or summary of the content. The last chapter of the main body of this report (8. Conclusions & Discussion) repeats the results of all other chapters by answering all research question in a chorological way. The answers to the sub-questions in that chapter do not present new information. It does also formulate the answer to the main research question, including recommendations, the scientific relevance of the results, and the limitations of the research.

2. Theoretical framework

This chapter is a theoretical framework of the concepts of interest in this research. The goal of this chapter is to evaluate the literature on this subject and create a scientific base for the rest of this study. The first part takes a closer look at the normative elements in the Smart City development. The second part evaluates research on Public value, including definitions of the terms Public value and Public value in the Smart City, and how Public value relates to social value and other term that are commonly used interchangeably with Public value. The last part presents different methods and theories about measuring Public values in the Smart City.
The results of this chapter are an answer to the first sub-questions SQ. 1.1 & 1.2.

2.1. The normative elements in Smart City development

As stated in the previous chapter, this research will focus on the normative elements in Smart City development and evaluate to what extent these elements can explain different Smart City development approaches. Before the normative elements of the Smart Cities at interest will be analysed, it needs to be clear what the exact meaning of these concepts is. Raven *et al.* (2017) define the normative element as "The pillar that places emphasis on rules that introduce prescriptive, evaluative and obligatory pressures and refers to things like values, role expectations, social norms, duties, responsibilities, i.e. normative rules prescribe what is considered appropriate behaviour" (p.4). This is a broad definition that entail different aspects. A more widely used theoretical concept that covers most of the aspects from Raven's definition of the normative elements is the concept of Public value. This study will attempt to find the differences in Public value between different Smart City development strategies. The next section will take a closer look at the theoretical concept of Public value.

2.2. Public value

When talking about Public value, many scholars refer to Mark Moore's seminar *Creating Public value* (1995) (Meynhardt, 2009; Papi, et al., 2018; Talbot, 2008; Smith, 2004). This work is considered the fundamental idea behind the concept of Public value.

2.2.1. Moore's idea of Public value

Mark Moore argued in his seminar *Creating Public value* (1995) that "public policy should focus on the creation of Public value that can (1) create something valuable; (2) obtain legitimacy and political sustainability from the authorizing environment; and (3) be operationally feasible" (p.71). With this he implies that the goal of public policy should always be the creation of Public value. Talbot (2008) interpreted the work of Moore in a way to measure the performance of public agencies by stating three aspects of performance: (1) Delivering actual services, (2) Achieving social outcomes, and (3) Maintaining trust and legitimacy of the agency (p.4).
Moore (1995) also emphasized the importance of government managers. He claims that government managers secure the resources they need to operate not by selling products and services to individual customers, but by selling a story of Public value creation to elected representatives of the people in legislatures and executive branch positions (p. 92-94). Which makes the government managers the responsible actor for securing Public value creation.

2.2.2. Towards a definition of Public value

The work of Moore was revolutionary and paved the way for many other studies, even though it did not give a clear and workable definition of the term Public value. Moore focussed more on using the new concept to explain other phenomena. Later work tried to better specify the concept of Public value. Smith (2004), for example, explains the emersion of Public value by "the need in the public sector for new stories to make sense of recent storms of change, and that focusing on 'Public value' helps tell a useful new story" (p.68). And Talbot (2011) further explains this by claiming that "Public value seems ideally suited to the new era of spending reviews and economies facing much of Europe" (p. 28). Both of these explanations provide a better understanding of what the concept is about, but still do not give a clear definition that covers the whole idea.

Finding a clear definition of what Public value entails has become a subject of many scientific contributions (e.g. Tablot, 2011; Maynhardt, 2009; Mu, et al., 2015; de Bruijn & Dicke, 2006). A popular definition is the one contributed by Talbot (2008). He states: "Public value is what the Public values" (p. 28). Meynhardt (2009) took this definition and elaborates it to: "Public value is what impacts on values about the 'public'" (p.205). This is a shorter version of the full definition Meynhardt gave in the same contribution. He defines the term "Public value" as "being about valuing "the public," and more precisely: valuing relationships between a subject (individual, group) and an unknowable social entity" (p.204). Further research take a different perspective on the concept. For example: "Public value is about values characterizing the relationship between an individual and 'society', defining the quality of this relationship" (Meynhardt, 2009, p.206). This role of Public value in this relationship is further emphasized by Bozeman (2007) in his contribution *Public values and Public Interest: Counter-balancing Economic Individualism*. His definition makes Public values the means in the political process. Bozeman (2007) defines Public values as: "A society's 'Public values' are those providing normative consensus about (1) the rights, benefits, and prerogatives to which citizens should (and should not) be entitled; (2) the obligations of citizens to society, the state and one another; (3) and the principles on which governments and policies should be based" (p.37). Yet another view is the view by Chanut *et al.*, who propose to study the value practices. Which means they are: "focusing on the process dimension of the emergence and use of values and focusing on the controversies and nonlinear developments to which they are subject" (p.222). The idea of value practices highlights the fact that the values are not stable or permanent but are continually changing through the interactions of the actors whose concerns they express (Chanut, et al., 2015, p.222).

2.2.3. Public value vs. Social value

To get a more specific understanding of the concept of Public value, this section dissects the term and compares it with seemingly similar terms like social value. The dissection of the term takes a closer at both sides, "public" and "value".
"Values" is one of those ambiguous container terms with enormous promise of insight but no widespread consensus (Meynhardt, 2009, p.196). For this research, the definition of value by Gaus (1990) as presented in the work of Bozeman & Sarewitz (2011) is considered leading. He defines a value as "a complex and broad-based assessment of an object or set of objects (where the objects may be concrete, psychological, socially constructed, or a combination of all three) characterized by both cognitive and emotive elements, arrived at after some deliberation, and, because a value is part of the individual's definition of self, it is not easily changed and it has the potential to elicit action" (p.12).

The different uses of the first part of the term, 'public', comes from the different sectors that the term is used in. Smith (2004) explains this by stating that: "A focus on Public value enables one to bring together

debates about values, institutions, systems, processes and people, and it also enables one to link insights from different analytical perspectives, including public policy, policy analysis, management, economics, political science and governance" (p.68-9). The different sectors or disciplines in which the term Public value is used, creates ambiguity in the meaning. Therefore, several terms are used as sub-categories to better clarify the specific meaning. Spano (2009) lists: "artistic value, historical value, social value, ethical value, cultural value or economic value, just to give some examples" (p.331).
For a value to be called "Public", there has to be a collectivity, an aggregation level that can benefit from the protection of this value (Bruijn & Dicke, 2006, p. 719). Social values refer more to socially collective beliefs and systems of beliefs that operate as guiding principles in life. (Tsirogianni & Gaskell, 2011, p.442).

2.2.4. Public value in public policy

By now it is clear that Public value is a broad term that can be defined in many different ways. For this research, a more public policy specific definition will be used. Mu *et al.* (2015) explain that "in public policy, Public value refers to an appraisal of what is created by government on behalf of the public; it reflects the survival and welfare need and right to which citizenry feels entitled" (p. 67). An important note by Smith (2004) on this is that "Public value is not the property of particular political parties, public service institutions, academic disciplines or professions, but it is rather defined and redefined through social and political interaction" (p.69). He also states that "focusing on Public value enables one to aggregate issues for scholarly analysis in terms that should also make sense to citizens and communities, political activists and people responsible for delivering public services" (p.68).
For this research, Public value is defined as a product of public policy. The working definition for Public value in this research is:

Public value is the positive effect on social welfare for the citizens or society created by specifically focused public policy.

Note that this definition sees Public value as the effect or result of a policy. Finding the values that are considered important for the citizens or society is possible by analysing the effectiveness of the policy.

2.2.5. Public value in the Smart City

When looking at the role of Public value in Smart City development, the definition in the previous section can be used to motivate that the effectiveness of a Smart City development policy relates to the Public value it strives to achieve. The article by Raven *et al.* (2017) describes the normative elements of three Smart Cities and with that provide a first impression of the role of Public values in the Smart Cities. The normative elements of two of these cities, Amsterdam and Hamburg, are elaborated in the description of the Smart Cities in section 1.1. For this research, the Public value in Smart City development is defined as:

The added value that is created for the citizens or society by the Smart City initiatives and projects.

This value can diverge from a more sustainable city to more citizen involvement, depending on the focus of the public policy. The goal of this research is to add scientifically relevant knowledge about the role of Public value in Smart City development.

2.3. Measuring Public value in the Smart City

The definitions of both terms defined in the previous section refer to the result or effect of the public policy as main indicator for Public value, which means that prior knowledge about the values that are deemed important by the citizens is crucial for effective Smart City development. This contradicts the commonly used definitions of Public value, since they all focus on Public value as a result, not as a means. This section will evaluate different methods of measuring the Public values that are important in the Smart City, in an attempt to find a suitable theoretical framework for finding the Public values serving as means. This requires not only a way to find and evaluate Public values, but also a way to analyse discourse around the decision-making process of the Smart City. Therefore, the first part of this section evaluates different theories on categorizing Public values, and the second part focusses on measuring or mapping the discourse in and around the Smart City development.

2.3.1. Categorization of Public value

Although no single, commonly used measurement of Public value exists, an increasing number of studies have attempted to develop Public value measurement techniques (Faulkner & Kaufman, 2018, p.70). Many scientific contributions attempt to structure Public values by creating a framework or scheme (e.g. Faulkner & Kaufman, 2018; Friedman, et al., 2006; Gonzalez, 2015; Meynhardt, 2009). This section evaluates different theoretical frameworks on the categorization or mapping of Public values.

Public value in technological development

Looking at research that is specifically focussed on the Public value in technological development might open possibilities for specific categorization of Public values in this study, since the main focus here is on the technological development of Smart Cities. The role of value in technological developments is discussed by Gonzalez (2015) in his contribution *New Perspectives on Technology, Values, and Ethics*. He defines two types of technological values: (1) internal values in technology (that affect objectives, processes, and outcomes), and (2) external values in technology (social, cultural, economic, ecological, etc.). According to Gonzalez (2015), "these values—internal and external—have increasing relevance for citizens concerned with the present and future state of technology, which gives society a leading position in technological issues" (p.5). Splitting the values of these two types can make it easier to place them in the discourse playfield of Smart City development.
Another interpretation of values in technological development is given by Friedman *et al.* (2006) in the contribution *Value Sensitive Design and Information Systems*. This study focussed primarily on the effect on ICT. Friedman *et al.* (2006, p.17-8) list 12 different human values that may be important for the areas of ICT: *human welfare, ownership and property, privacy, freedom from bias, universal usability, trust, autonomy, informed consent, accountability, courtesy, identity, calmness, and environmental sustainability*. These twelve values can be used to explain all differences in Smart City implementation by basing all statement on one of them, which results in all values being presented in the statements.

The strength of these theories is that they both specifically focus on technological development. When analysing Public value in the Smart City, it might be helpful to focus on values that can usually be found in technological development. The weakness of these methods regarding this study is that they both cover the subject in a superficial manner and that they do not present a schematic overview of the framework.

Public value Mapping by Bozeman & Sarewitz (2011)

A more comprehensive framework is the one created by Barry Bozeman. Since 2002 he has several publications about values and similar subjects. His work from 2011, *Public value Mapping and Science Policy Evaluation* together with Daniel Sarewitz, presents the concept of Public value Mapping (PVM). Their main goal of that contribution is to: "present the framework of a new approach to assessing the capacity of research programs to achieve social goals" (p.1).
Put simply, Public value mapping is an approach to identifying the Public value premises of public policy and then tracking their evolution and impacts on policies and, ultimately, social outcomes (Bozeman & Sarewitz, 2011, p.13). It tries to measure the values by evaluating their role in all steps of the process. Bozeman & Sarewitz do not see PVM as a method that tries to encloses all aspects, it is rather thought of as an "analytical confederation" and "viewed as a loose set of heuristics for developing analyses of Public values" (p.14-5).
PVM starts with the formulation of a set of assumptions. These assumptions define the boundaries and intentions of the PVM. The twelve core assumptions as presented by Bozeman & Sarewitz (2011) can be found in Appendix II. They note with the classifications of these core assumptions that the assumptions are not inviolable (p.15). The next step in PVM is the creation of the *Public value Mapping Criteria Model*, with the goal of "structuring analysis and assessment" (p.16). Discussion and argumentation about Public values and their measurement proves less troubling in those instances when there is a clear starting point, when one has at his or her disposal Public value criteria (Bozeman & Sarewitz, 2011, p.16). The model formulates the criteria based on the principles of market failure, translated to Public values failure. Bozeman & Sarewitz (2011) describe this as: "Public values failure occurs when neither the market nor public sector provides goods and services required to achieve Public values" (p.16). The chief point of PVM criteria is to expand the discussion of public policy and management by assuming that government (and market organizations as well) needs to be more than a means of ensuring market successes and technical efficiency in pricing structures (Bozeman & Sarewitz, 2011, p.16).
Bozeman & Sarewitz note that the *Public value Mapping Criteria Model* is not a decision-making tool or a tool cost-benefit analysis, but that it is rather "a framework to (1) promote deliberation about Public value (and its relation to economic value) and (2) provide guideposts for analysis and evaluation, within the context of Public value mapping" (p.16). Appendix II presents the general diagnostics model for Public value Criteria. The PVM criteria themselves are not actual Public values but, rather, a set of diagnostics applicable to questions of science policy and research evaluation (Bozeman & Sarewitz, 2011, p.16).

The main strength of PVM is the theoretical motivation of the model. The core assumptions formulated beforehand provide a reliable scientific base for further implementation. Referring to this model for measuring Public values is certain to be approved in peer-reviews. The weakness of the model regarding this research is the lack of actual Public values in the criteria. This increases ambiguity when placing political discourse statements in certain Public value categories. The model is also more economically focussed in nature.

Public value dimensions by Faulkner & Kaufman (2018)

Faulkner & Kaufman (2018) advocate in their contribution *Avoiding Theoretical Stagnation: A Systematic Review and Framework for Measuring Public value*, that Public values can be divided over four dimensions called the *Public value Measurement Dimensions*. Faulkner & Kaufman (2018) name the four dimensions of Public value measurement: (1) Outcome achievement (e.g. Social outcomes, Economic outcomes, Environmental outcomes, Cultural outcomes), (2) Trust and Legitimacy (e.g. Trust in organization, Transparent and fair processes, Perceived as legitimate), (3) Service delivery quality (e.g. Client satisfaction, Responsiveness, Suitable citizen engagement, Accessibility, Convenience), and (4) Efficiency (e.g. Value for money, Minimal bureaucracy, Benefits outweigh costs) (p.77). "Outcome achievement" refers to the extent to which a public body is improving publicly valued outcomes across a wide variety of areas (Faulkner & Kaufman, 2018, p.77). 'Trust and legitimacy' refers to the extent to which an organisation and its activities are trusted and perceived to be legitimate by the public and by key stakeholders (Faulkner & Kaufman, 2018, p.79). 'Service delivery quality' refers to the extent to which services are experienced as being delivered in high-quality manner that is considerate of users' needs (Faulkner & Kaufman, 2018, p.79). 'Efficiency' refers to the extent to which an organisation is achieving maximal benefits with minimal resources (Faulkner & Kaufman, 2018, p.79).

The main strength of the method is the clear difference between the dimensions and the in-depth explanation of the specific meaning of the dimensions. The weakness of this method regarding this study is that the example values given for the dimensions are very specific and are therefore not likely to host many different statements from the political discourse.

Public value Landscape by Meynhardt (2009)

A more schematic framework of presenting values in dimensions (like Faulkner & Kaufman also did) is the one presented by Timo Meynhardt (2009) in his contribution *Public value Inside: What is Public value Creation.* He created the *Public value landscape* presented in Figure 2.1. The landscape divides Public value over 4 dimensions: (1) Moral-ethical, (2) Hedonistic-esthetical, (3) Political-social, and (4) Utilitarian-Instrumental. With these four dimensions, Meynhardt claims to be able to "add to both a non-empirical, deductive and an empirical, inductive method when discussing how to construct out talk about Public values" (p.207). The basic dimensions serve as "yardsticks" in a Public value landscape (Meynhardt, 2009, p.207).
In the landscape, all four dimensions have four cells with Public values. The values presented in italics are nodal values that Meynhardt based on the Public value inventory by Beck Jørgensen and Bozeman (2007). The advantage of the approach chosen by Beck Jørgensen and Bozeman is a focus on the relationships ("subject-object relations") where the different values emerge (Meynhardt, 2009, p.207).

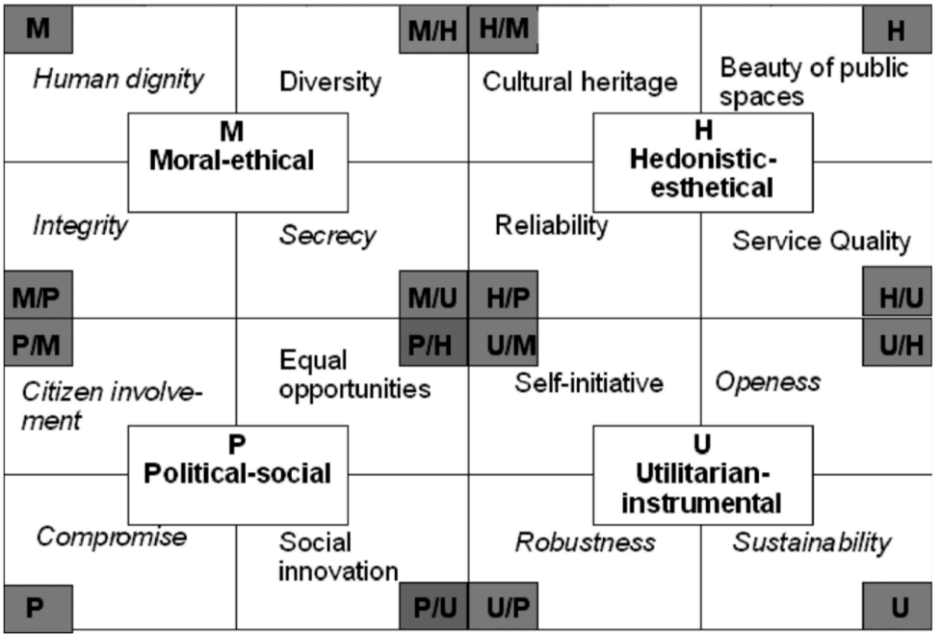


Figure 2.1 Public value landscape (Meynhardt, 2009, p.208)

The values presented in the cells can be interpreted from many different perspectives. Meynhardt (2011) covered this ambiguity by stating that "a deductive construction must be accompanied by inductive methods" (p.208). In this case, it means to start with the "object" under consideration and then apply the different ("interrelated, yet not substitutable") perspectives (Meynhardt, 2009, p.207). Meynhardt formulated four basic value question one could ask to find the perspective and the dimension it belongs to. These questions are (1) Moral-ethical: "What are moral implications on the individual as a 'person'?", (2) Hedonistic-aesthetic: "What positive or negative experiences are associated with our action for the individual?", (3) Political-social: "What are political chances and risks?", and (4) Utilitarian-instrumental: "What is the rational basis? What is the cost-benefit ratio?" (p.208-9). Both deductively as well as inductively the four basic dimensions of value can be also applied to analyse the content of Public value (Meynhardt, 2009, p.208).

The Public value landscape is a combination of two of the methods presented before. It uses Public values formulated by Bozeman and places them over four dimensions like Faulkner & Kaufman did. Thus, the main strength of the Public value landscape is the sub-division of 16 values over four dimensions and the included visual schematics. This structured and visual approach allows for a clear translation to further research. Another strength of the landscape are the basic value questions that are formulated to categorize perspectives. This can be useful for the interpretation of discourse coalitions. The weakness of the Public value landscape regarding this research is the little motivation for the specific values in the dimensions. One could argue that a value should belong in another dimension, or that these values do not cover the whole dimension.

2.3.2. Mapping political discourse

The second part of measuring the Public values in Smart City development is finding a way to analyse the discourse of the decision-making process in Smart City projects. The method from this section should be able to structure the discourse in such a way that it allows for Public value extraction with one of the methods mentioned in the previous section.

Discourse Coalitions by Hajer (1993)

A leading theory for political discourse analysis is the concept of *Discourse Coalition*s. The concept of Discourse Coalitions is introduced by Maarten Hajer in his contribution "Discourse Coalitions and the Institutionalization of Practice: The Case of Acid Rain in Britain" (1993). This concept analyses specific language in the political discourse to find groups that are sharing the same ideas and opens possibilities to study the political process such as *mobilization of bias.* Hajer (1993) defines discourse as "an ensemble of ideas, concepts, and categories through which meaning is given to phenomena" (p.45).
Hajer (1993) describes the function of the concept of discourse coalition as "The real challenge for argumentative analysis is to find ways of combining the analysis of the discursive productions of reality with the analysis of the (extra-discursive) social practices from which social constructs emerge and in which the actors that make these statements engage" (p.45). In a simplified version, this means that a *discourse coalition* is a group of actors or stakeholders involved in a decision-making process or projects that share the same ideas of or perspective on reality. In the decision-making arena, actors from the same discourse coalition are likely to agree on certain statements even though there are not necessary formally related. Actors try to impose their views of reality on others, sometimes through debate and persuasion, but also through manipulation and exercise of power (Hajer, 1993, p.45). The way in which the actors formulate their shared view or opinion Hajer called "Story Lines" or "Narratives". The discourse coalition approach suggests that once a new discourse is formulated, it will produce story lines on specific problems, employing the conceptual machinery of the new discourse (e.g. sustainable development) (Hajer, 1993, p.47). The story line concept can best be described as people standing around and looking at an object from different angles. Everyone sees the same object, but might describe it differently due to its position. The story lines are all different ways of looking at the same situation. A discourse coalition is thus the ensemble of a set of story lines, the actors that utter these story lines, and the practices that conform to these story lines, all organized around a discourse (Hajer, 1993, p.47).

The idea of discourse coalitions can help in describing the different approaches or opinions on the Smart City, but it cannot define the actual values that form the story lines. In order to do this, the possible Public values that play a role need to be mapped in a structured manner with the use of one the methods presented in the previous section.
The next chapter is the method description of this research. This chapter also includes the theoretical methods or theories that will be used in the analysis of this research.

2.4. Summary of the theoretical framework

This chapter evaluated relevant scientific contributions in the field of Public value. For this research, Public value is defined as a product of public policy. The working definition for Public value in this research is: "*Public value is the positive effect on social welfare for the citizens or society created by specifically focused public policy"*. And Public value in Smart City development is defined as: "*The added value that is created for the citizens or society by the Smart City initiatives and projects".*
The definitions of both terms refer to the result or effect of the public policy as main indicator for Public value, which means that prior knowledge about the values that are deemed important by the citizens is crucial for effective Smart City development. This contradicts the commonly used definitions of Public value, since they all focus on Public value as a result, not as a means.

In an attempt to find the Public values serving as means, a suitable theoretical framework needs to be used. This framework requires not only a way to find and evaluate Public values, but also a way to analyse discourse around the decision-making process of the Smart City. Therefore, multiple different types of Public value categorization method are evaluated. These include: two theories about Public value in technological development, Public value Mapping by Bozeman & Sarewitz (2011), Public value dimensions by Faulkner & Kaufman (2018), and Public value Landscape by Meynhardt (2009). And a theory on political discourse analysis has been described, being the theory of Discourse Coalitions by Hajer (1993). All these methods or theories are described and evaluated according to their relevance for this research. The next chapter describes the methods that are used in the rest of this research.

3. Methodology

This chapter describes the methods that are used to answer the research question. A specific and clear constructing of the methods will enhance the structure of the research. In this method description, the (subjective) choices and assumptions made in this research will be motivated on theoretical bases.

As presented in the previous chapter, the attempt of this research to use Public value as a means require not only a method for categorizing Public value, but also a way to analyse political discourse. The theory of discourse coalitions by Hajer (1993) is used in this research as a base for the political discourse analysis. A research method that is known for using statements from discourse to formulate perspectives, is the Q-methodology (also referred to as the Q-method or simply Q). This method is often used for its ability to analyse abstract subjects in a multi-actor environment. The subject under study, the Public values in Smart City development, is an abstract subject in a multi-actor system and therefore, the Q-method will be used in this research to formulate the different perspectives in the discourse coalitions. The book "Doing Q Methodological Research" by Simon Watts and Paul Stenner (2012) is considered as an important enchiridion for the Q-method, so this chapter will refer multiple times to this book.

This chapter continues with an introduction of the Q-method, followed by a motivation for Q being the best method for this research. After this, the Q-method is further elaborated in a way that it becomes clear how this method is used to answer to research questions.

3.1. What is the Q-methodology?

The Q method is a conceptual research framework that combines qualitative and quantitative data collected from interviews (see Cuppen, 2010; Jeliazkova, 2015; Siddo, et al., 2018; Zhou & Mayer, 2018). The Q methodology made its first appearance in 1935, in the guise of a letter to the journal *Nature* authored by Willian Stephenson (Watts & Stenner, 2012, p.7). The method uses correlation statistics to interpret factor analysis in an innovative way, with the goal to study people's subjectivity (Watts & Stenner, 2012; Brown, 1980). Traditional factor analysis, also known as R-methodology, continues today as a foundational technique in the social and behavioural sciences for measuring traits – or variables – across populations (Kelly & Young, 2017, p.171). Q methodology differs from R-methodology (surveys and questionnaires) in that the latter asks respondents to express views on isolated statements, whereas Q methodology identifies respondents' views on statements in the context of the valuation of all statements presented (see Cuppen, 2010; Gilbert Silvius, et al., 2017). Q Methodology can uncover perspectives without imposing predefined categories (Cuppen, 2010, p.104).

A Q-method based research usually consists of five major steps: (1) Developing a list of statements referred to as the Q-set, (2) Selecting participants referred to as the P-sample, (3) Gathering the data in interviewing participants by letting them distribute the statements, this distribution is referred to as the Q-sort, (4) Analysis of the data by using computer based statistics referred to as the Q-analysis, and (5) Interpretation of the analysis and formulating perspectives (see Watts & Stenner, 2012; Brown, 1980; Cuppen, 2010). Section 3.3 to 3.7 will elaborate each step of the Q-methodology more detailed.

3.2. Why is the Q-method the best method for this research?

The main benefit of the Q-methodology over other Multiple-criteria decision-making (MCDM) or the R-methodology is the ability to not only rank individual statements on a point-scale, but also to compare the statements among each other (See Cuppen, 2010; Jeliazkova, 2015; Brown, 1980). The given distribution for the statements forces the participants, for example, to make a comparison between statements that were initially both totally agreed upon.

Another benefit of the Q-method is the possibility to translate an abstract subject into terms that are familiar to the participants. This is what makes the method particularly well fitted for measuring behaviour and values. Binding Public values to every-day tasks or, like in this research, project development is usually an unconscious process. Therefore, participants will experience difficulty ranking bare Public values. Presenting the values in a way that is recognizable from the daily activities of the participants will allow for a more intuitively motivated judgement.

The more qualitative nature of the Q-method also allows to create a clear picture of the situation under study, without a large number of interviews. Specific problems with a limited number of stakeholders can be studied by interviewing only the dedicated actors involved, and still get valuable results.

3.3. Gathering Public values statements for Smart City development (Q-set)

The first step of the Q-method is to generate the Q-set. A Q-set must be tailored to the requirements of the investigation and to the demands of the research question it is seeking to answer (Watts & Stenner, 2012, p.57). The inductive nature of this study and the relatively new field that it tries to uncover require a literature based structured Q-set. This means that in order to find the statements that add up to the Q-set, it has to be clear what is understood by the terms Smart City and Public value. The first chapter has already emphasized the Smart City concept. The definition set in chapter 1 will be used throughout the rest of this study. Public value is defined in the previous chapter. Both are executed with a review of the relevant literature. This literature review focused on books, scientific articles, conference contributions, or other peer-reviewed scientific content. This content is searched with the use of the online databases Scopus, Science Direct, too lesser extent Google Scholar, and the TU Delft library. The input for these search engines are (among others) “Smart City development”, “Public values”, and “Smart City” AND “Public values”.

The result of this review is a clear definition of Public value and the Smart City in general. It also entails a description of how Public values can be measured in the Smart City, including some theories on mapping Public values. The theory for mapping Public values that is used for this research, is the Public value landscape by Meynhardt (2009). The schematic representation of the values and the structured sorting over four dimensions allow to categorize the statements extracted from the discourse in a structured way. It also allows to motivate the description of the perspectives based on the landscape. Another benefit of the landscape by Meynhardt (2009) is that it combines content from multiple relevant studies. This gives the landscape a solid theoretical base and a clear structured schematic representation of this theory.

Using the landscape of Meynhardt (2009) means that the statements that are extracted from the literature are all formulated to present one of the following Public values: (1) Moral-ethical dimensions: *Human dignity*, *Diversity*, *Integrity*, or *Secrecy*, (2) Hedonistic-esthetical dimension: *Cultural heritage*, *Beauty of public spaces*, *Reliability*, or *Service Quality*, (3) Political-social dimension: *Citizen involvement*, *Equal opportunities*, *Compromise*, or *Social innovation*, or (4) Utilitarian-instrumental dimension: *Self-initiative*, *Openness*, *Robustness*, or *Sustainability*.

The statements will be searched in the literature, official documents, and other discourse about the development in the cities of interest. This can also include news articles, interviews, and speeches. The

main focus will be on documents that are related to the decision-making process. All statements should be about one of the listed Public values in a form of Smart City development.
About the size of the Q-set is no generic consensus. According to Watts & Stenner (2012), "A Q-set of somewhere between 40 and 80 items has become the house standard" (p.61). But they also add an example where a 25-item Q-set gave satisfactory results. For this study, a relatively small Q-set will be used. The focus will be more on the qualitative part, in an attempt to get a first idea about what the Public value playfield looks like in the Smart City development.
The goal is to create a list of 50 to 80 quotes, which can be translated or restructured into statements. This list of quotes is further referred to as the 'long list' of statements. The long list will be shortened into a list of 20 to 30 statements, referred to as the 'short list'. This short list attempts to include all topics and opinions that are present in the long list, without having two statements with identical meaning. Some statements in the short list can be summarized version of multiple quotes from the long list. The short list is referred to as the Q-set.
The results of the statement gathering will be presented in chapter 4. However, to explain the rest of the method in a way that is more specifically focussed on this study, the results of the Q-set development are already presented here. The long list consists of 70 statements and the Q-set consists of 24 statements.

By applying these methods in the previous chapter 2 about Public value and in the next chapter on creating the Q-set, an answer to the first sub-question will be found: "What Public values can influence the Smart City Implementation?".

3.4. Finding dedicated actors as participants (P-set)

The second step in the process of Q-methodology is finding people and organisations that are fitted to be representative participants for this study. To find the actors, a stakeholder analysis will be conducted. The stakeholder analysis will be performed in line with chapter 4 of the book "Policy Analysis of Multi-Actor Systems" by Enserink *et al.* (2010). The method described in this book provides a structured approach for mapping complex multi-actor problems. [Viewing a problem] from a multi-actor perspective not only enables a public–private interface but also helps to identify what types of actors are involved [in the problem] (Li, et al., 2016, p.373). This makes the method particularly well fit for studying the complex actor network of a Smart City.
The analysis presented by Enserink *et al.* (2010) consists of 6 steps. The rest of this section will go over every step separately and motivates how this step is used in this specific research.

Step 1: Initial Problem formulation
The first step of the stakeholder analysis is the problem formulation as a point of departure. This describes the problem at hand and why this is a problem for the problem owner. Even though the problem will partly correspond with the research question of the study, a clear formulation of the problem for the actor analysis makes the situation clearer and easier to explain.

Step 2: Inventory of the Actors
The second step is finding the stakeholders for the cities of interest and describing them briefly. The article by Raven (2017) provides an overview of the Smart City organisation in the cities of Amsterdam and Hamburg. The actors listed in these overviews, will be used as a starting point for listing all actors involved in the Smart City of these cities. This list will be expanded with the use of general literature about the Smart City development in those cities. This step will also include a brief description of every actor in a general way. Their role in the Smart City will be revealed in the next steps.

Step 3: Mapping formal relations

The third step is the mapping of formal relations. The analysis should begin by mapping out the formal positions and relations because these are mostly easy to reconstruct using available documents (Raven, et al., 2010, p.89). A formal relation chard based on the available documents will be made for both cities separately. The relations include ownership, involvements, or contracts.

Step 4: Problem formulation of actors

The next step is to make a problem description for all actors separately. For every actor, the main interest, the desired situation or objective, the existing situation and gap, and the causes for this gap are formulated. The results will be presented as shown in Table 3.1. This will create an overview of how all actors see the problem.

Table 3.1 Overview table of actor problem formulation (See Enserink et al., 2010, p.94)

ORGANISATION	INTERESTS	DESIRED SITUATION / OBJECTIVE	EXISTING OR EXPECTED SITUATION AND GAP	CAUSES
ACTOR 1				
ACTOR 2				
…				
ACTOR N				

Step 5: Analyse Interdependencies

Based on the actor description, the interdependencies can be formulated. This will be done by listing the resources of the actors, the resource dependency, and by identifying the critical actors. Table 3.2 gives the overview table that will be used.

The resource dependency of one actor in relation to a second actor depends on the importance of the resources held by the second actor and the degree to which these resources can be replaced by other resources (Enserink, et al., 2010, p.97). The resource of the actors, as well as the score on 'replaceable' and 'dependency', are based on their position in the Smart City in general. Possible resources are: information, knowledge and skills, manpower, money, authority/formal power, position in network/support from or access to other actors, legitimacy, or organization/ability to mobilize and use resources effectively and efficiently (See Enserink, et al., 2010, p.96-7). Critical actors are those on whom a problem owner critically depends for solving his problem (Enserink, et al., 2010, p.96). In this case, it means that the Smart City cannot exist without these actors.

Table 3.2 Overview table for determining critical and non-critical actors (Enserink et al., 2010, p.98)

CITY	ORGANISATION	IMPORTANT RESOURCE	REPLACEABLE?	DEPENDENCY	CRITICAL ACTOR?
AMS / HAM	Actor 1		YES / NO	High / Average / Limited	YES / NO
	Actor 2		YES / NO	High / Average / Limited	YES / NO
	…		YES / NO	High / Average / Limited	YES / NO
	Actor n		YES / NO	High / Average / Limited	YES / NO

The dependency on other parties in not only influenced by the resources these parties have, but also by their interest in the problem and their willingness to use their resources (Enserink, et al., 2010, p.98). This willingness to use their resources is referred to as the actor's *dedication*. Dedicated actors are likely to use their resources. Table 3.3 shows the overview table that categorizes the actors in four groups, based on their dedication and if they are critical.

Table 3.3 Overview table for classification of interdependencies (Enserink, et al., 2010, p.99)

Dedicated actors		**Non-dedicated actors**	
Critical actors	Non-critical actors	Critical actors	Non-critical actors
Actor …	Actor ….	Actor …	Actor…

To visualize the results of the actor dependencies, a power vs. interest matrix (also referred to as the Mendelow-matrix) will be made. Figure 3.1 shows the power vs. interest diagram.
Critical actors are those with a high level of power – i.e. important resources – while dedicated actors are those with high level of interest in the problem (Enserink, et al., 2010, p.100).

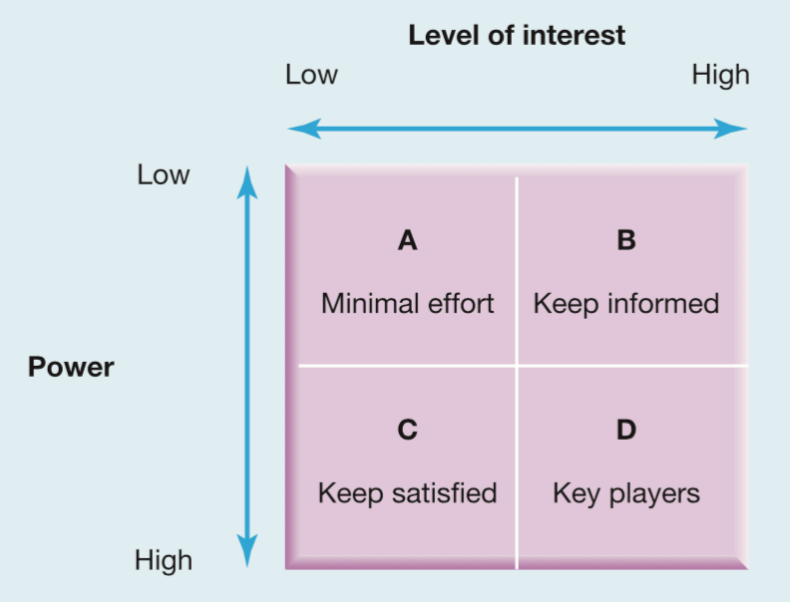


Figure 3.1 Power vs. Interest diagram (Johnson, et al., 2008, p.156, citing Mendelow, 1991)

Step 6: Concluding the results
The last step of the actor analysis is formulating the conclusions. The most important part of this step is the formulation of the P-set for the Q-study. It will also leave some room for findings from the actor analysis that are relevant, but not presented in the P-set. For example, the formal relations can show a central position of an organization that acts on the background when looking at the problem formulation and dedication.

Actors that have a high level of interest (this means in segment B or D in the power vs. interest diagram) are referred to as the P-set. Actors from the P-set will be contacted to find people that are willing to participate. The final participants are referred to as the P-sample.
About the minimum size of the P-sample is also no generic consensus. Watts & Stenner (2012) provide several example studies with as conclusion: "Since Q methodology positively embrace studies using smaller numbers of participants, however, and given that we know papers that have been rejected for using *more* participants, it may be sensible to stick to a number of participants that is *less than the number of items in your Q-set"* (p.73). For this study, a maximum of 10 participants per city will be used.
Applying this actor analysis for both cities, which will be done in chapter 5, will answer the second sub research question: "Who are the dedicated actors in the Smart City development?".

3.5. Collecting the data (Q-sort)

The third step is the actual collecting of the quantitative and qualitative data. This will be done by having face to face interviews with the dedicated actors presented in the previous section. The goal is to have a maximum of 10 interviews per city.
In general, the interview starts with asking the respondents to elaborate their function and their main ideas about the Smart City development. After that, the respondents will be asked to give their opinion on the statements from the Q-set. All statements will first be divided into three groups: Agree, Disagree, and Neutral or No opinion. The three piles will then be evaluated again to divide them in a normal distribution as shown in Figure 3.2. When the distribution is made, three open questions will be asked in an attempt to find the motivation for the choices they made. These three open questions are: "Why are these statements at the extremes?", "Do you miss specific statements?" and "Do you want to change your initial opinion on this topic?" (see Cuppen, 2010). The answers to the open questions can later be used to explain certain perspectives.
These interviews are referred to as the Q-interviews, and the distributions as Q-sorts.

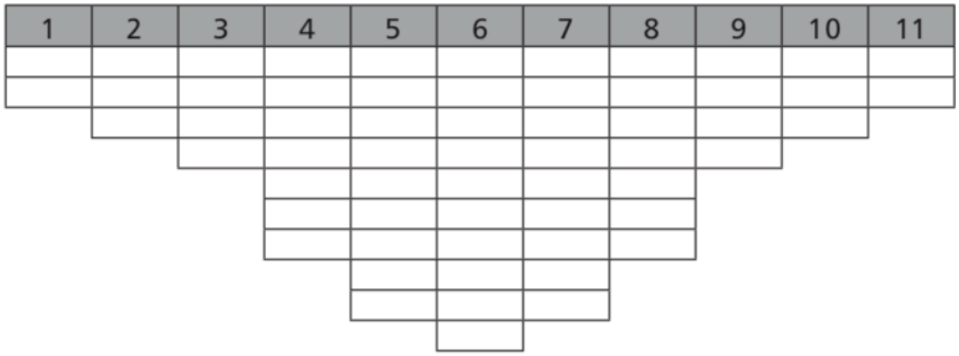


Figure 3.2 General Q distribution used for the Q sorting task (Cuppen, 2010)

This Q-set of this study consist of 24 statements. The distribution that is used for the Q sorting, can be changed accordingly. The shape of the distribution is also up for debate. A wider distribution allows for a better distinction between the statements, while a steeper distribution gives a clearer image of the perspectives. If the participants are likely to be quite unfamiliar with the topic, or if it is especially complex, a steeper distribution is recommended (Watts & Stenner, 2012, p.80). The motivation for this recommendation is because it allows for more statements being near the middle (neutral part) of the distribution.
The distribution that is used in this research, is presented in Figure 3.3. It is a steep, 7-point distribution, with 2 elements at both extremes.

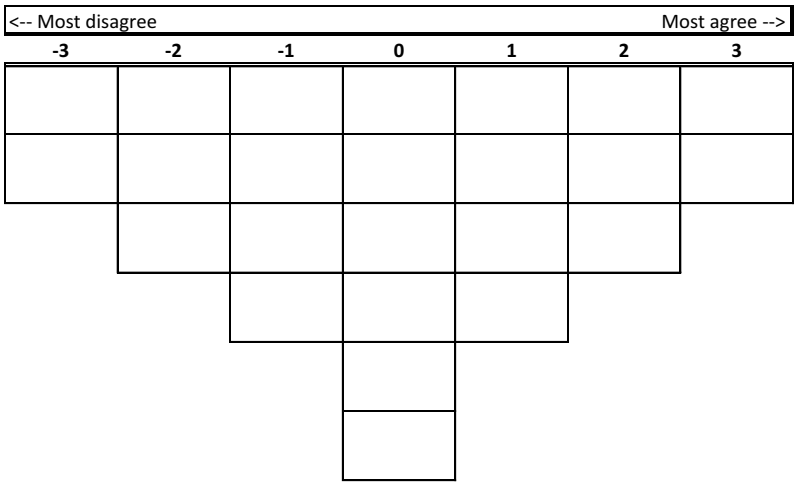


Figure 3.3 Specific Q distribution for the Q sorting

In every interview, the participant will be asked to distribute the Q-set over this distribution. After the Q-sort is created, the participant will also be asked for a motivation. The questions that will be asked are: (1) "Why are these statements at the extremes?", (2) "Do you miss specific statements?", (3) "Do you consider any of the statements to be fundamentally wrong?", and (4) "Do you suggest someone else I should talk to about this topic?". The answers to these qualitative questions will be used in formulating the perspectives. The participants will also be asked to give their opinion about the method.
A description of the execution of this method is presented in chapter 6 "Q-interviews".

3.6. Analysing the data (Q-analysis)

The next step of the Q-method is to analyse the collected data. The main goal is to reduce the amount of data to an extent that it can be effectively interpreted.
The data analysis will be executed with the help of the software program PQMethod (by Schmolck, 2002). This section highlights the steps that are taken in the process of data analysis. For a detailed step-by-step description of the analytical process, see Watts & Stenner (2012; ch.5-6). The process consists of three main steps: (1) Factor extraction, (2) Factor rotation, and (3) Creation of factor arrays. The choices made in these three steps are motivated in this section.

3.6.1. Factor extraction

What is factor extraction?
The first, and most important, step in the data analysis is the factor extraction. In essence, factor analysis is merely a complicated tautology which serves to break down a correlation coefficient into component parts (Brown, 1980, p.223). This means that the factors are perspectives of the studied situation that are common among the participants. There is an infinite amount of possible perspectives, what makes the selection of these factors an important step in the analytical process. Watts & Stenner (2012) use an analogy of a cake, where all Q-sorts are ingredients and the factors are slices of the cake. Any cake can legitimately be sliced in a huge variety of different ways, none of which could be thought of as universally correct or definitive, but very many of which could prove *acceptable*, insofar as they lead to the cake's division into sensible and easily digested portions (Watts & Stenner, 2012, p.95). How 'the cake will be cut' in this research is mainly mathematically motivated in terms of common variance and correlation. This is due to the inductive nature of this study; 'we don't know what to look for'.

Why is factor analysis used as data reduction method?
When entering all the Q-sorts in PQMethod, the output-file will first show a intercorrelation matrix for all Q-sorts. Which is basically an overview of how much the Q-sorts correlates with each other. This matrix is the starting point for factor extraction or any other data reduction strategy, since it contains all the data and thus 100% of the meanings and data obtained by the study. Data reduction uses common variance to find common meanings in the data. Common variance is the proportion of the meaning and variability in a Q-sort or study that is *held in common* with, or by, the group (Watts & Stenner, 2012, p.98).
The data reduction option that is chosen to be used in this research is *factor analysis*, instead of the other option *Principal component analysis* (PCA). The key difference in the current context is simply that PCA will resolve itself into a single, mathematically *best* solution, which is the one that *should* be accepted (Watts & Stenner, 2012, p.99). *Factor analysis* allows for more insight during the analytical process and therefore leaves room for visual modifications based on prior knowledge or common sense. The *factor analysis* option that is offered by PQMethod is *centroid factor analysis* (CFA). This extraction method leaves all possible solutions open, it allows us to legitimately explore these possibilities through rotation and it enables us to defer a decision until we have explored the data further (Watts & Stenner, 2012, p.99).

How many factors should be extracted?
When choosing the CFA option in PQMethod the software will ask *"How many Centroids do you wish to extract?"*, which refers to the number of factors/perspectives that will be extracted from the data. This is a crucial point in the analysis, since it will define all outcomes from this point onwards.
The choice of the number of factors extracted for this study, will be made post analysis. Which means that a high number of factors will be extracted at first. Review of the results will then filter only the statistically significant factors. Brown (1980) provide a good starting point for choosing the number of factors to be extracted. "Experience has indicated that 'the magic number 7' is generally suitable" (Brown, 1980, p.223). At the start of the factor analysis process in this research, only four factors will be extracted. The limited number of Q-sort makes it unnecessary to extract a total of seven factors.

When performing a centroid factor analysis in PQMethod, the software will output a factor matrix. Table 3.4 shows the overview table for an unrotated factor matrix. PQMethod will fill the Q-sorts/factor matrix with factor loadings. These factor loadings or factor saturations illustrate the extent to which our illustrative subset of Q-sorts exemplify, or are typical of, Factor 1 (Watts & Stenner, 2012, p.101). The factor loading squared gives a percentage of the extent to which that factor shows the perspective of that specific Q-sort. The h^2 is the communality of that Q-sort. The communality of each Q-sort is calculated by summing its squared factor loadings (Watts & Stenner, 2012, p.104). The Eigenvalue (EV) is also an indicator of communality, but this time in the columns. A factor's EV is calculated by summing the squared loadings of all the Q-sorts on that factor (Watts & Stenner, 2012, p.104). The Variance in the table is calculated by dividing the EV by the total number of Q-sorts and multiplying this by 100 (See Brown, 1980, p.222).

Table 3.4 Overview table of unrotated factor matrix

Q-sort	Factor 1	Factor 2	Factor …	Factor n	$\mathbf{h^2}$	$\mathbf{h^2}$ **(%)**
1						
2						
…						
n						
Eigenvalue (EV)						
Variance (%)						

The EV and Variance from the factor matrix are both indicators of the statistical significance of the factors. Therefore, these indicators will be used to filter the significant factors. The criterion that is used to which the factors should comply in order to be considered significant, is the Kaiser-Guttman criterion (See Kaiser, 1960; Guttman, 1954). This criterion says that only the factors with an EV of 1.00 or higher should be considered relevant. The motivation for this is that an EV of less than 1.00 means that this factor has a lower study variance than a single Q-sort, which means that there is no data reduction (See Watts & Stenner, 2012, p.105-6).

When the Kaiser-Guttman criterion gives a large number of relevant factors, visual observation might suggest an extra criterion for a factor to be relevant. Brown (1980) suggest that for a factor to be significant, at least two of the factor loadings should be considered statistically significant. According to Brown (1980, p.222-223), for a loading to be significant at the 0.01 level, it must exceed (2.58 * SE_r). Where SE_r is the standard error of a zero-order loading. Equation 2.1 shows how to calculate the SE_r, where n is the number of statements in the Q-set.

$$SE_r = \frac{1}{\sqrt{n}} = \frac{1}{\sqrt{24}} = 0.204124 \; = \; 0.20 \qquad (2.1)$$

The SE_r of 0.20 results in a significant factor loading of *(2.58 * 0.20 =) 0.516*. Two of the factor loadings must exceed this number for the factor to be considered relevant. The factors are rated for significance by these criteria after the factor rotation, which will be elaborated in the next section.

3.6.2. Factor rotation

The second step is the rotation of the extracted factors. The general idea of factor rotation is to focus the factors more on clusters of Q-sorts, in an attempt to capture specific perspectives with the factors. In factor rotation, the factor loadings are used as coordinates in a spatial or geometric function and hence as a means of mapping the relative positions, or viewpoint, of all the Q sorts in a study (Watts & Stenner, 2012, p.114). The idea behind this special mapping is that the origin of the grid represents the studied situation, and the dots (Q-sorts) represent all different ways to look at that situation (perspectives). So, when there is a group of dots in the grid very close to each other, it means that they have a shared perspective defined by the factors that are on the axis.
Factor rotation is used to focus the factors specifically on these perspectives, so that the factors represent that cluster of Q-sorts (and thus opinions). Figure 3.4 shows an example of factor rotation. The data that is represented in this figure is from the example used by Watts & Stenner (2012).

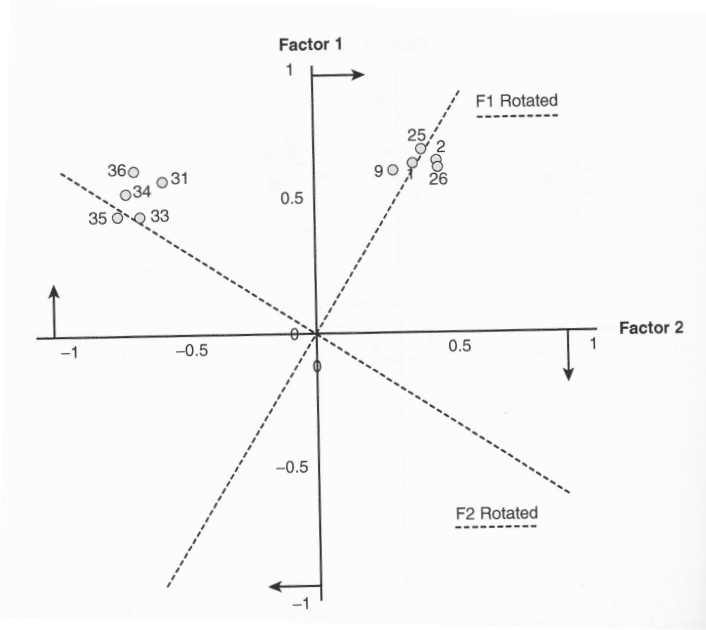


Figure 3.4 Factor rotation example (Watts & Stenner, 2012, p.118)

PQMethod offers two methods for factor rotation. One is the by-hand technique, where the user can rotate the factors by hand in a graphical environment. The second method is the varimax procedure. In this case, PQMethod will rotate the factors automatically, positioning them according to statistical criteria and so that, taken together, the factors account for the maximum amount of study variance (Watts & Stenner, 2012, p.122).
This study will use a combination of both methods. First, the varimax procedure will be applied. This is because of the limited prior knowledge about possible perspectives. After this step, the results will be evaluated and checked for outlaying perspectives that are not covered by the varimax procedure. When necessary, the factors will be adjusted accordingly by hand.
When the factor rotation is finished, the program will output the rotated factor matrix. This table holds the same (but updated) information as Table 3.4.

3.6.3. Factor estimates and factor arrays

The last step of the analytical process is the creation of factor estimates and arrays. This is a translation step from the factors, towards terms of the original data. A factor estimate is ordinarily prepared via a weighted averaging of all the individual Q-sorts that load significant on that factor and that factor alone (Watts & Stenner, 2012, p.129). Recall from section 3.6.1 that the significant factor loading is 0.516. This step basically divides the Q-sorts over the factors. By doing so, all Q-sorts are divided into separate perspectives of the situation. This process is called the 'flagging' of factors. A Q-sort is *flagged* for a factor when it exceeds the significant factor loading in only that factor. When the Q-sort has significant loadings for more than one factor, the Q-sort is called confounded. When the Q-sort has no significant factor loadings, the Q-sort is called non-significant.
The factor estimates are calculated by PQMethod. For more details on how the factor weights are being calculated, see Brown (1980, p.242) and Watts & Stenner (2012, p.132).
The factor estimates can now be calculated by multiplying the weights and the original score each statement got in all separate Q-sorts. This study has a 7-point distribution (-3 to +3), where a score of 1 represents an initial value of -3 and 7 an initial score of +3. Table 3.5 shows the overview table for the calculation of the factor estimates, where (i) is the score on the 7-point scale of that statement in that

specific Q-sort. The output file of the analysis will create separate tables that can be combined in the table presented below.

Table 3.5 Overview of factor estimate table (Watts & Stenner, 2012, p.134-137)

Q-sort	**1**	**2**	**…**	**n**	**Total**	**z-score**	**F array**
Weight					-	-	-
Item							
1	(i) …	(i) …					
2							
…							
n							
					Sum	**Mean**	**SD**

The *Total* column will give a sum of the weighed scores. This total score cannot be compared with total scores of other factors, since every factor can hold a different number of Q-sorts. In order to facilitate cross-factor comparisons, the total scores must be converted into z (or standard) scores (Watts & Stenner, 2012, p.139). According to Brown (1980, p.242-243) the z-score of item x can be calculated as in Equation 2.2

$$z\ score\ (x) = \frac{Total\ Weighted\ Score\ for\ item\ x - Total\ Weighted\ Scores\ for\ All\ Items}{Standard\ deviation\ of\ Total\ Weighted\ Scores\ for\ All\ items} \qquad (2.2)$$

The last column gives the factor array for the specific factor that is represented in the table. A factor array is no more or less than *a single Q-sort configured to represent the viewpoint of a particular factor* (Watts & Stenner, 2012, p.140). The column in the factor estimate table gives a score on the original 7-point scale, in a way that the scores of all statements are put in the same distribution as the original Q-sorts.

3.6.4. Summary of the analysis

This section lists the most important decisions that will be made in the analysis of the data. All these decisions are motivated above.

- Four factors will be extracted initially with the use of the Centroid Factor analysis;
- The factors will be rotated with the use of the Varimax method;
- Visual evaluation of the rotated factors can lead to extra manual rotation;
- A factor will be rated significant when it meets these requirements based on their factor loadings and Eigenvalue:
    - Eigenvalue must be 1.00 or higher (Kaiser-Guttman criterion);
    - At least two of the factor loadings should be greater than the significant factor loading of *(2.58 * 0.20 =) 0.516;*
- The Q-sort is flagged for a significant factor when it exceeds the significant factor loading for only that factor;
- The factor array, that is based on the factor estimates, will be used for interpretation.

3.7. Interpretation of the Factors

The final step of the Q-methodology is the interpretation of the factors that are created in the analysis. In this step, the factor arrays are interpreted to formulate the perspective that the factor is trying to describe. Watts & Stenner (2012) provide a way to make sense of the factor arrays, which is called the crib sheet. The crib sheet is no more or less than a security blanket; it is a way of ensuring that nothing obvious gets missed or overlooked (Watts & Stenner, 2012, p.150). This method will be used as a guideline in the process of factor interpretation in this study.

The method first translates the factor arrays to a table which holds the statements and the score of those statements in every factor. This table allows a cross-factor comparison. With the use of this table, the crib sheet will be created. The crib sheet extracts the statements/items into four different categories: (1) the items with the highest ranking, (2) the items with the lowest ranking, (3) items ranked higher than in all other factors, and (4) items ranked lower than in all other factors (See Watts & Stenner, 2012, p.153). The list of items that confirm these criteria will be created for every factor. In this way, the crib sheets allow first to identify those important issues about which the factor's viewpoint is polarized and second, they show how the viewpoint is polarized relative to the other study factors (Watts & Stenner, 2012, p.153). Especially the position relative to the other factors is something that is likely to be missed when only evaluating the factor arrays. This method also requires to go over every single item multiple times, in this way to ensure that a full picture of the perspective will be created.

The last step is to build the story that is told by the perspective. This is also the part where the qualitative questions from the interviews will be used. The relative positions of the statements and the motivation from the participants will together lead to a description of their perspective. Or as Watts & Stenner (2012) put it: "Use your participants' words and any relevant demographic information to clarify and interpret the signs and clues contained in each array and don't be tempted to impose your own views and expectations" (Watts & Stenner, 2012, p.166).

With this analysis and interpretation of the factors, which will be presented in chapter 7 "Q-analysis", an answer to the third sub research questions can be formulated: "What are the different perspectives of Public values in Smart City decision-making?".

3.8. Application of the results

The results of the Q-methodology are a list of different perspectives of Public value in the Smart City. For a decision-maker, this knowledge can be difficult to interpret. One way of interpreting the results, is with the Smart City maturity model from the professional contribution by Deloitte, cited as Van Dijk, *et al.* (2015), which is also mentioned in the first chapter in the section on "Implantations of the Smart City concept". The Smart City maturity model, presented in Appendix I, defines four stages of development for a Smart City including characteristics on these stages over eight domains.

The characteristics of the Smart City development stages will be compared with the newly formulated description of the two Smart Cities under study, and also with the perspectives formulated as a result of the Q-method. The goal of this comparison is to see if the cities and perspectives match a stage of Smart City development, and if recommendations can be formulated based on these findings.

Note that this is a professional, and not a peer-reviewed, contribution. This means that the main conclusion will not be based on this application.

With the application of the results, an answer to the third sub research question will be given: "What effect can the different perspectives of Public values on decision-making have in the Smart City implementation?".

3.9. Summary of the Methodology

This chapter explains the methods that are used in this research to answer the research question formulated in chapter 1. The main research method used in this research is the Q-methodology. The Q method is a conceptual research framework that combines qualitative and quantitative data collected from interviews. This method is used to structure the rest of the report and to answer to sub research questions.

The first sub research question is about the Public values that can influence Smart City implementation. The Public value landscape by Meynhardt (2009) is used to categorise the statements in the Q-set.
The second sub research question is about the dedicated actors in the cities under study. The actor analysis by Enserink, *et al.* (2010) is used to find these actors in both cities. These actors are potentially part of the P-sample, i.e. the participants.
The third sub research question is about the different perspectives of Public value in the Smart City. The Q-analysis and factor interpretation from the Q-method are used to find and formulate these perspectives.

4. Creating the Q-set

This chapter contains the step from the theoretical framework of Public value in Chapter 2 towards the Q-set, which is the first step in the Q-methodology. A list of statements, derived from the literature, that displays different Public values bound to Smart City development and projects is created.

For extracting the statements, both city specific and general literature about the Smart City are used. Appendix III contains the full list of statements extracted from the literature. This is a total of 70 statements, also including the Public value that it describes and its source.

Table 4.1 presents the Q-set. This is the short list of statements; the statements that are used in the interviews. The number in the first column represents the position of that statement in the long-list. The number in the last column represents the number of the statements as it is used in the analysis. The statements are placed in a different order, to prevent the creation of bias by having groups of statements on the same topic. The Public value for every statement is based on the dimensional separation of Public value presented by Meynhardt (2009). The letter in front of every value indicates the dimension of that value.

Table 4.1 Q-set, short list of statements

#	Statement	Public value	Q#
1	The large number of interconnected devices in the Smart City require a central system of defence. Layered security approaches and transparent standards for privacy are crucial to the construction of smart cities.	M-Secrecy	15
4	The Smart City governance should work closely with citizens, because this will accelerate Smart City development.	P-Social innovation	14
5	From a Smart City perspective, success within the domain of smart living can be achieved by providing environmental well-being and material well-being.	U-Sustainability	17
7	The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.	U-Sustainability	20
10	In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.	H-Reliability	7
11	Sharing and spreading the knowledge acquired during the path towards the Smart City transformation are actions of crucial importance.	P-Social innovation	8
13	Because of the use of mobile applications to engage with citizens, there is a risk that the needs of low-income individuals, less-educated groups, the elderly, and others in need, that do not have smart devices and/or do not know how to use them, will be excluded.	P-Equal opportunities	18
21	'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.	P-Citizen involvement	1
24	Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.	H-Cultural heritage	13
26	Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.	U-Openness	22

#	Statement	Public value	Q#
32	Creativity is recognized as a key driver to Smart City, and thus people, education, learning and knowledge have central importance to Smart City.	P-Social innovation	6
35	Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.	M-Human dignity	10
36	The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.	P-Citizen involvement	2
37	A Smart City initiative should come from a private innovation platform, not as a city driven program.	P-Compromise	4
42	Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.	M-Integrity	24
43	Smart Cities are about working together, about cooperation, about collectively working towards a common goal.	M-Integrity	5
50	A bottom-up methodology (open source data, where the input comes from the citizens and not from the companies) can provide the best results.	P-Social innovation	19
53	The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.	U-Robustness	23
54	The Smart City should focus on the use of real-time information to respond rapidly to emergencies and threats, because the larger the population gets, the quicker the emergency response needs to be.	U-Sustainability	9
56	Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.	M-Secrecy	16
57	All projects should be built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.	U-Sustainability	12
61	"Health Infrastructure" should mainly focus on the aging population, because they can increasingly benefit from digital patient files and personal health management.	H-Service Quality	11
62	We can only solve the challenges of urbanization by working closely with all of the players in politics and business.	P-Compromise	3
65	To make innovation succeed, openness in business is essential.	U-Openness	21

The Q-set consist of 24 statements. Of these 24, nine of the statements are from the Political-social dimension, six from the Utilitarian-instrumental dimension, five from the Moral-ethical dimension, and four from the Hedonistic-aesthetic dimension. A slightly bigger proportion of political-social values is used, because of the focus on policy making. This research tries to find the Public values that influence the policy making process. More statements about a political-social motivation allow for a better understanding of that specific dimension of interest.
The list of statements presented in the Q-set provides an answer to sub research question 1.4.

5. Actor Analysis of Smart City development

This chapter is an actor analysis towards the P-sample, which is the second step in the Q-methodology. With this actor analysis, this chapter will answer the second sub-question. The goal of this research question is to find the dedicated and critical actors in the Smart Cities of Amsterdam and Hamburg, that fit the profile to be participants in this Q-study. The actor analysis is performed according to the method described by Enserink *et al.* (2010). A full description of this method is provided in section 3.4 "Finding dedicated actors as participants (P-set)". Every step of the method, except for step 1, is done for both cities separately.

5.1. Step 1: Problem formulation

The first step of the actor analysis is the formulation of the problem and the identification of the problem owner. The rest of the actor analysis is built around this problem and from the perspective of the problem owner.

The problem is for both cities the same. Both cities try to implement the Smart City concept in a way that attracts businesses and is accepted by local citizens. The goal of the Smart City is to improve the quality of life for the citizens, while increasing economic viability of the city.
The problem owner for both cities is the local government, i.e. the City of Amsterdam and the City of Hamburg.

5.2. Step 2: Actor description

The second step of the actor analysis is the actor description. The selection of actors is based on official documents and reports regarding the Smart City and only includes the stakeholders that play an active role in the decision-making process. The local citizens are not considered actors, since they do not form an active group in the process. The citizens can be represented by another actor in, for example, activist or focus groups. The central government is also not considered as an actor. It is assumed that the local authorities represent the central government, which means that the central government will not play an active role as actor.

This section gives a list of all actors involved in the problem, including a short description of the actors. Most of the descriptions are based on the company description retrieved from the web-page of the corresponding organisation. These references are indicated with […] and refer to chapter 10 Web references.

5.2.1. Actor description Amsterdam

In Amsterdam, numerous projects are executed as part of the Smart City platform. This includes all activities in the whole metropolitan area around the city. For this actor analysis, only the organisations with a specific focus on the Smart City, or a direct involvement in more than one project, will be included. The actors are selected based on reports specifically focussing on the Smart City of Amsterdam (e.g. Dutch Government, 2017; Lammerse, 2016; Staal, 2017; Winden et al., 2016).

Table 5.1 Actor description Amsterdam

ORGANISATION	DESCRIPTION
Alliander	Alliander is an energy network company that provides a reliable, affordable and accessible energy transport and distribution to a large part of the Netherlands. [1]
Amsterdam Arena	Since 1996, they have been involved in numerous leading projects and sports tournaments worldwide. [2]
Amsterdam Economic Board	The Amsterdam Economic Board is made up of leading directors of academic institutions, company CEOs, alderpersons and mayors from the Amsterdam Metropolitan Area. Together they are devising the strategy for the metropolis of the future. [3]
Amsterdam Smart City Platform	Amsterdam Smart City (ASC) is a platform for a future proof city that is constantly challenging businesses, residents, the municipality and knowledge institutions to test innovative ideas & solutions for urban issues. The platform connects these Smart City innovators to help set-up innovative projects and solutions in Amsterdam and beyond. [4]
Arcadis	Arcadis works with cities across the world, giving them a competitive edge and improving quality of life for their residents, visitors and businesses by building programs that expand resiliency, encourage regeneration, and maximize mobility. [5]
Citizen Data Lab (CDL)	The Citizen Data Lab is a research Lab in the Amsterdam University of Applied Sciences, faculty of Digital Media and Creative Industries. The lab brings together researchers, experts, citizens and students in addressing local issues through participatory data practices. [6]
City of Amsterdam (Gemeente Amsterdam)	The municipal government of the city Amsterdam.
Chief Technology Office Amsterdam (CTO)	The CTO of the Municipality of Amsterdam collaborates with all departments from the municipality to make innovation happen in the city. [7]
Focus Groups	Specific focus groups are collections of entrepreneurs and local citizens that strive for improvement in a certain topic, e.g. energy transition. Examples of focus groups in the energy transition are 02025 and AVEnergie.
Hogeschool Van Amsterdam (HvA); Amsterdam University of Applied Sciences	Knowledge institution based in Amsterdam that ensures that internationalisation is integrally embedded in the educational programmes and research activities. [8]
KPN	KPN is a supplier of innovative IT-services and aims with a large supply of products and services to connect different customers with different brands all over the world. [9]
Pakhuis De Zwijger	Pakhuis de Zwijger is a unique cultural organisation which opened its doors in 2006 and has grown to be an independent platform for and by the city of Amsterdam and its inhabitants. [10]
PostNL	PostNL is the essential link between senders and receivers of mail and parcels in The Netherlands. Whether it is online or through their physical networks, they aim to facilitate a seamless connection. [11]

ORGANISATION	DESCRIPTION
TNO	TNO is an independent research organisation that connects people and knowledge to create innovations that boost the sustainable competitive strength of industry and well-being of society. [12]
WAAG Society	WAAG operates at the intersection of science, technology and the arts. Their work focuses on emergent technologies as instruments of social change, and is guided by the values of fairness, openness and inclusivity. [13]

5.2.2. Actor description Hamburg

In Hamburg, only the actors that have a role in the development of the Smart City will be listed. All actors that are affected by the development, especially in the harbour area, will be considered as the crowd.

Table 5.2 Actor description Hamburg

ORGANISATION	DESCRIPTION
Cisco	Cisco Systems, Inc. is an American multinational technology conglomerate that develops, manufactures and sells networking hardware, telecommunications equipment and other high-technology services and products; Official partner with the City of Hamburg and Hamburg Port Authority in Smart City development [14]
City of Hamburg	The municipal government of the city Hamburg.
City Science Lab	The City Science Lab of HafenCity University Hamburg is exploring the transformation of cities in the context of digitization with partners from civil society, politics, business and science. It pursues an interdisciplinary and transdisciplinary perspective by linking technical issues with social and cultural developments. [15]
Hafencity Hamburg	Europe's largest inner-city urban development project as a blueprint for the new European city on the waterfront. In developing a new urban area on the Elbe, Hamburg is setting new standards in Europe and beyond as an ambitious integrated urban development, answering both local needs and global requirements. [16]
Hafencity University (HCU)	The HCU for Environment and Metropolitan Development is the only university in Europe devoted solely to research and teaching in the field of the built-up environment, offering architecture, civil engineering, geomatics and urban planning under one roof. [17]
Hamburg Energie	Hamburg Energie GmbH is a privately-organized energy supply company (electricity and gas), which is 100% owned by the water supplier Hamburg Wasser, which in turn is fully owned by the Free and Hanseatic City of Hamburg. [18]
Hamburger Hafen Und Logistik Ag (HHLA)	Hamburger Hafen und Logistik AG (HHLA) is a leading European port and transport logistics company. Its container hubs are the points of intersection within a network that links ports with economic regions in their hinterland. [19]
Hamburg Port Authority (HPA)	The Hamburg Port Authority AöR (HPA) operates the port management from a single source. They are responsible for planning and carrying out

ORGANISATION	DESCRIPTION
	infrastructure measures as well as guaranteeing safety and simplicity of the shipping. [20]
Hamburg University of Applied Sciences (HAW)	Hamburg University of Applied Sciences (HAW Hamburg) is one of the largest of its kind in Germany and within the four faculties they offer a wide range of Bachelor's and Master's programmes in engineering, IT, life sciences, design and media as well as business and social sciences. [21]
Hamburg University (UH)	Universität Hamburg is the largest institution for research and education in the north of Germany. As one of the country's largest universities, they offer a diverse course spectrum and excellent research opportunities. [22]
MLOVE	MLOVE is a global community that drives the Future of Mobility, Internet of Things and Smart Cities; Innovation consultancy. [23]
Vattenfall	Vattenfall is a leading European energy company, that for more than 100 years has electrified industries, supplied energy to people's homes and modernised the way of living through innovation and cooperation. [24]

5.3. Step 3: Mapping formal relations

The third step in the actor analysis is the mapping of the formal relations between the actors described in the previous section. This allows to get a better idea about the position of every actor in the network.

5.3.1. Formal relations Amsterdam

The formal relations in the Smart City of Amsterdam are presented in Figure 5.1. The single-sided arrows indicate hierarchical relationships, where the arrow points to the actor that hierarchically influenced or owned by the other actor. The two-sided arrows indicate representation or membership.

The motivation for most of the relations are retrieved from the actor description in the previous section. The most important relations and the relations that are not presented in the description are:

- The Amsterdam Smart City Platform is funded by Alliander, KPN, City of Amsterdam, and Amsterdam Economic Board;
- The board members of the Amsterdam Economic Board are representatives from many organisations, including City of Amsterdam, Chief Technology Officer Amsterdam, and Amsterdam Arena;
- The local citizens are represented by Pakhuis de Zwijger and WAAG Society.

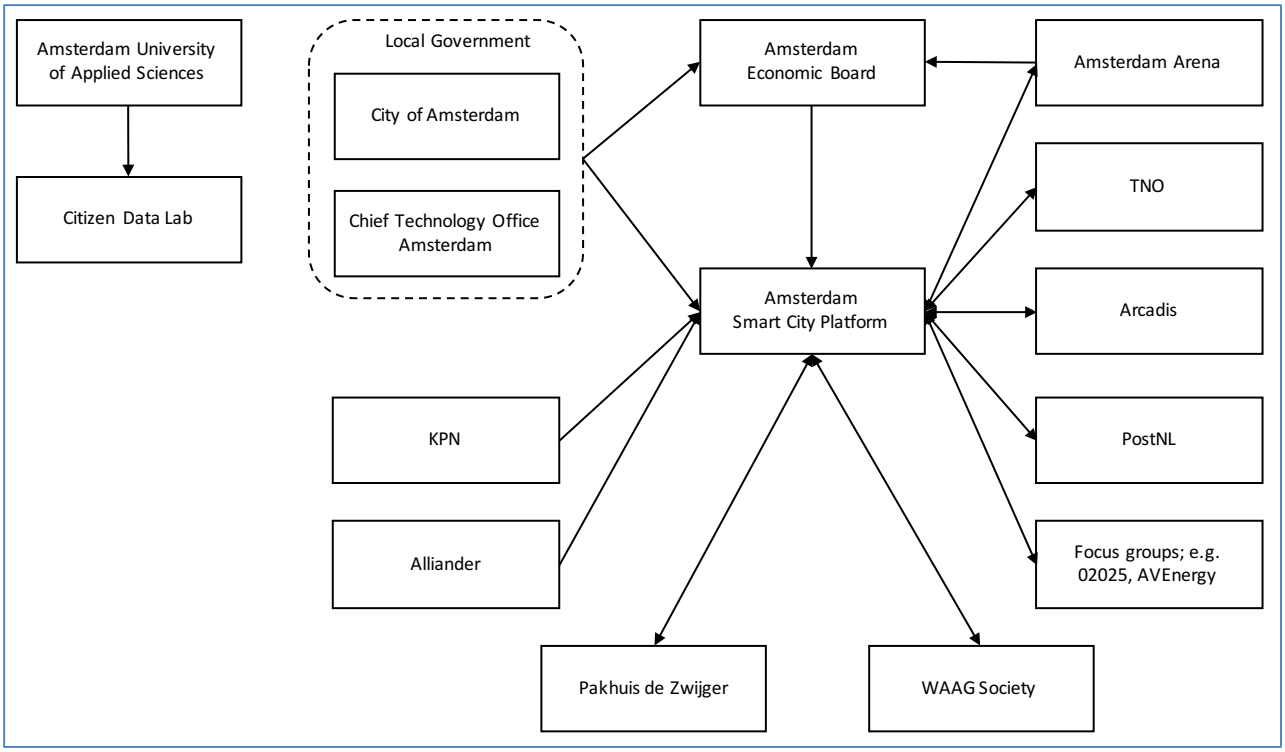


Figure 5.1 Formal relations Amsterdam

In the relations presented above, only the formal relations are shown. Informal influence relations are not included, which results in two actors that are not connected to any other actor (i.e. Amsterdam University of Applied Sciences and Citizen Data Lab). They may seem less important or less influential than they actually are.

5.3.2. Formal relations Hamburg

The formal relations in the Smart City of Hamburg are presented in Figure 5.2. The single-sided arrows indicate hierarchical relationships, where the arrow points to the actor that hierarchically influenced or owned by the other actor. The two-sided arrows indicate representation or membership.

The motivation for most of the relations are retrieved from the actor description in the previous section. The most important relations and the relations that are not presented in the description are:

- The City Science Lab is an organisation from the HafenCity University and represents the local citizens;
- The City of Hamburg is cooperating with Vattenfall via an agreement (2011) and with Cisco via the Memorandum of Understanding (2014);
- Both HafenCity Hamburg and Hamburg Port Authority are state led.

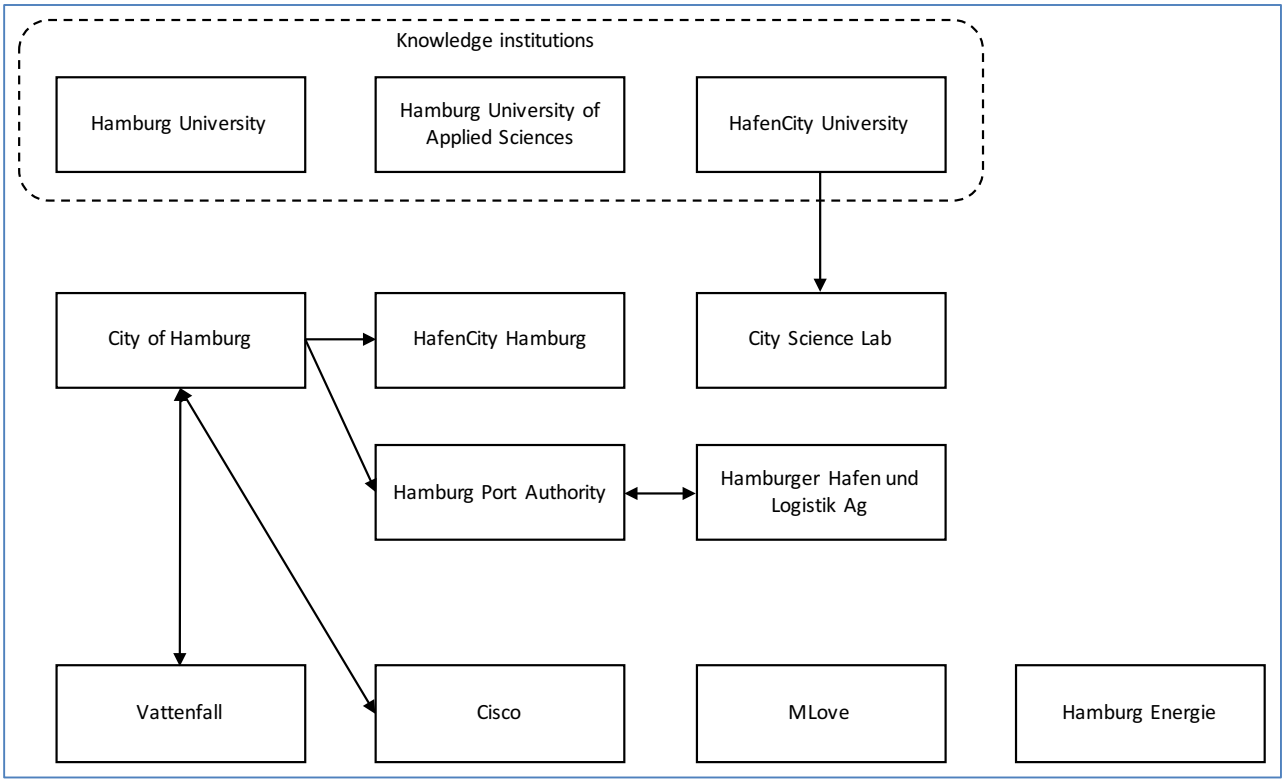


Figure 5.2 Formal relations Hamburg

Again, the informal influence relations are not included. This results in two actors that are not connected to any other actor (i.e. MLove and Hamburg Energie). They may seem less important or less influential than they actually are.

5.4. Step 4: Problem formulations of Actors

The fourth step in the actor analysis is the problem description of the actors. This step reveals the objectives and interest of all actors, which allows for a classification of the actors in the next step. The problem formulations in this section are partially based on the formal relations presented in the previous section.

Appendix IV contains the full problem formulation for every actor that is listed in the previous sections. This problem formulation shows the perspective of the actor in the Smart City. Some actors that see the Smart City from the same perspective are considered as one actor, e.g. different knowledge institutions. The rest of the actor analysis is based on the problem formulation presented in the appendix.

5.5. Step 5: Interdependency analysis

Based on the actor description and problem formulation in Appendix IV, the interdependencies can be analysed. Dependency is the degree to which the Smart City development is dependent on that specific actor. This interdependency analysis gives separate tables for both cities to find the critical actors and the dedicated actors. The results are also visualized in a power vs. interest diagram.

5.5.1. Interdependencies Amsterdam

The critical actors are found by looking at the resource that the actors have. Table 5.3 shows the table to find the critical and non-critical actors in Amsterdam.

Table 5.3 Critical and non-critical actors in Amsterdam

CITY	ORGANISATION	IMPORTANT RESOURCE	REPLACEABLE?	DEPENDENCY	CRITICAL ACTOR?
AMS	Alliander	Access to energy market	YES	Limited	NO
	Amsterdam ArenA	Organizational competence	YES	Limited	NO
	Amsterdam Economic board	Knowledge; Network	NO	High	YES
	Amsterdam Smart City Platform	Position in Network	NO	High	YES
	Arcadis	Knowledge in management	YES	Limited	NO
	Citizen Data Lab	Knowledge	YES	Limited	NO
	City of Amsterdam	Formal power	NO	High	YES
	CTO Amsterdam	Authority	NO	Average	YES
	Focus Groups	Relation with local communities	YES	Limited	NO
	Hogeschool van Amsterdam (HvA)	Knowledge	YES	Limited	NO
	KPN	Access to IT-service market	YES	Limited	NO
	Pakhuis de Zwijger	Relation with local communities	NO	Average	YES

CITY	ORGANISATION	IMPORTANT RESOURCE	REPLACEABLE?	DEPENDENCY	CRITICAL ACTOR?
	PostNL	Access to logistics market	YES	Limited	NO
	TNO	Knowledge	YES	Limited	NO
	WAAG society	Relation with local communities	NO	Average	YES

The next step is to find the dedicated actors. This is based on the actor's willingness to use their resources. Table 5.4 shows the classification of independencies in Amsterdam.

Table 5.4 Classification of interdependencies in Amsterdam

Dedicated actors		**Non-dedicated actors**	
Critical actors	**Non-critical actors**	**Critical actors**	**Non-critical actors**
Amsterdam Economic Board	Citizen Data Lab	City of Amsterdam	Alliander
Amsterdam Smart City Platform	Focus groups		Amsterdam ArenA
CTO Amsterdam	Hogeschool van Amsterdam		Arcadis
Pakhuis de Zwijger			KPN
WAAG			PostNL
			TNO

To visualize the result from Table 5.3 and Table 5.4 and to indicate the position of the actors in the network, a power vs. interest diagram for the actors in Amsterdam is presented in Table 5.5.

Table 5.5 Power vs. interest diagram Amsterdam

Context setters: City of Amsterdam	**Key players:** Amsterdam Economic board Amsterdam Smart City Platform CTO Amsterdam Pakhuis de Zwijger WAAG-society
Crowd: Alliander Amsterdam ArenA Arcadis KPN PostNL TNO	**Subjects:** Citizen Data Lab Focus groups Hogeschool van Amsterdam

5.5.2. Interdependencies Hamburg

The critical actors in Hamburg are found by looking at the resource that the actors have. Table 5.6 shows the table to find the critical and non-critical actors in Hamburg.

Table 5.6 Critical and non-critical actors in Hamburg

CITY	ORGANISATION	IMPORTANT RESOURCE	REPLACEABLE?	DEPENDENCY	CRITICAL ACTOR?
HAMBURG	CISCO	Formal initiator and consultant	NO	High	YES
	City of Hamburg	Formal power in the city	NO	High	YES
	City Science Lab	Knowledge	YES	Limited	NO
	HafenCity Hamburg	Project initiator	NO	High	YES
	HCU	Specific knowledge and expertise	NO	High	YES
	Hamburg Energie	Access to energy market	YES	Limited	NO
	HHLA	Access to logistics market	YES	Limited	NO
	HPA	Formal power in the port	NO	High	YES
	HAW	Knowledge	YES	Limited	NO
	UH	Knowledge	YES	Limited	NO
	MLOVE	Good position in network	NO	High	YES
	Vattenfall	Access to energy market	YES	Limited	NO

The next step is to find the dedicated actors. This is based on the actor's willingness to use their resources. Table 5.7 shows the classification of independencies in Hamburg.

Table 5.7 Classification of interdependencies in Hamburg

Dedicated actors		**Non-dedicated actors**	
Critical actors	**Non-critical actors**	**Critical actors**	**Non-critical actors**
CISCO	HHLA	City of Hamburg	Hamburg Energie
HCU	HAW	HPA	Vattenfall
MLOVE	UH		
HafenCity Hamburg			

To visualize the result from Table 5.6 and Table 5.7 and to indicate the position of the actors in the network, a power vs. interest diagram for the actors in Hamburg is presented in Table 5.8.

Table 5.8 Power vs. interest diagram Hamburg

Context setters: City of Hamburg HPA	**Key players:** CISCO HafenCity University (HCU) MLOVE HafenCity Hamburg
Crowd: Hamburg Energie Vattenfall	**Subjects:** HHLA HAW UH

5.6. Step 6: Conclusions of the Actor Analysis

Apart from the position of every actor in the network presented in the previous section, the actor analysis also provides other relevant insight for the situation at hand. This step retrieves conclusions from the actor analysis as a whole. By doing so, it creates a summary of all the steps.

Amsterdam

- The Amsterdam Smart City Platform has a central position in the formal network of the Smart City in Amsterdam;
- The goal of Pakhuis de Zwijger and WAAG Society is to represent the local citizens;
- The Amsterdam Economic Board forms the formal connection between the public and the private sector;
- Multiple actors see citizen involvement or citizen empowerment as the solution for more efficient Smart City development;
- Some actors agree that technological developments are not successful because citizens don't adopt it, but the reason of this differs. Tech-companies put the cause with the citizens because they don't know how to use them. Citizens representatives put the cause with the tech-companies because they don't involve the citizens in the development process.

Hamburg

- Hamburg does not have a centred organization that connects all other actors (like the Amsterdam Smart City platform in Amsterdam);
- MLove and Hamburg Energy do not have a formal relation with any other organization within the Smart City network;
- No specific organization advocates the local citizens for the policy agenda;
- In the Smart City of Hamburg, the private companies do not face specific problems with the Smart City development;
- Most actors agree that more citizen engagement and finding the needs of the citizens can be the solutions for most of the problems with Smart City development.

The list of dedicated actors form an answer to sub research question 2.

6. Q-Interviews

This chapter describes the third step of the Q-methodology, the data gathering process. This includes the selecting of participants, the execution, and a brief summary of the results.

6.1. Selecting respondents (P-sample)

Based on the actor analysis in the previous chapter, the P-set for this study can be configured. The P-set for this study is set to be all dedicated actors for the two cities. Table 6.1 shows the P-set.

Table 6.1 P-set, list of dedicated actors

Amsterdam	Hamburg
Amsterdam Economic Board	CISCO
Amsterdam Smart City Platform	HafenCity Hamburg
Citizen Data Lab	HAW
CTO Amsterdam	HCU
Focus groups	HHLA
Hogeschool van Amsterdam	MLOVE
Pakhuis de Zwijger	UH
WAAG Society	

All actors from the P-set are contacted to be part of the P-sample. Since not all dedicated actors are willing to participate, some actors from the "Crowd" and "Context setters" are also contacted. The participants from these organizations are part of the P-sample, presented in Table 6.2.

Table 6.2 P-sample, list of participants

Amsterdam	Hamburg
Alliander/Amsterdam Smart City Platform	City Science Lab
AVEnergie	HafenCity University (HCU) (2x)
Citizen Data Lab	HafenCity Hamburg GmbH
Hogeschool van Amsterdam	Hamburg University (UH)
KPN	
WAAG-society	
02025	

6.2. Execution of the interviews

All interviews are performed face-to-face on a location of the participants' choice, usually their office. After an introduction, the participants were asked to divide the statements over the Q-sort distribution that was also shown. The statements were handed out on cards one-by-one to ensure individual and separate judgements. After the Q-sort, the participants were also asked for a short motivation on their choices with the use of qualitative questions.

All results of the interviews are presented in Appendix V. This includes a description of the participant, the result of the Q-sort, and the answers to the qualitative questions.

6.3. Summary of qualitative data from interviews

This section gives a summary of the qualitative data that is gathered in the interviews and will be used for the factor description in the next chapter.

Table 6.3 summarizes the motivation the participants gave for placing a statement in the column of 'most agree'. The first column of the table is the number of the statement that it referred to, the second column is the corresponding participant code as given to each participant in the appendix, and the third column is a short version of the motivation the participant gave for their choices. The motivations are organized based on the statements.

Table 6.3 Motivation for the statements that are most agreed with

#	PARTICIPANT	MOTIVATION
1	MTDB06TH	The result/effect of every top-down solution fully depends on how the citizens handle it. If the public doesn't want it, the solution will not work.
2	MTDB01PV	Organisations should dare to be open for new inputs, to be able to achieve multiple goals and also create an added value for the public.
	MTDB02MP	It is important to create support in public communities, because it is necessary for upscaling (the next phase of Smart City implementation).
	MTDB04CB	It's not about the technology itself, but about what you can do with this technology. You can only find the possibilities of the technology by working closely together with the citizens. The Smart City should serve the people, not the corporations.
	MTDB05WM	We should stop trying to make the city smart, and start by focussing on making the citizens smart. Empowerment of the citizen is crucial for a well-developed Smart City.
	MTDB12FM	The goal is to set priorities and find key elements in the decision making. In that way, the best results can be achieved.
3	MTDB15PP	Working closely together with all the players is a key success factor for HafenCity. The diatomic thinking between the players prevents innovation.
5	MTDB03RV	Smart City = Stakeholder innovation. You can see a Smart City as one big jigsaw-puzzle, where all the stakeholders have a separate piece.
6	MTDB14EB	Innovation can only be achieved collaboratively, thus the Smart City should create digital competency among the citizens and educate people on how to handle the data.
8	MTDB12FM	Transparency in very important, not only for the government but for all actors. Knowledge should be considered a common good.
10	MTDB04CB	It's not about the technology itself, but about what you can do with this technology. You can only find the possibilities of the technology by working closely together with the citizens. The Smart City should serve the people, not the corporations.
	MTDB05WM	Technology is never neutral, and will therefore not always provide the best solution.
	MTDB11JT	Every development should start with the people, and not with IT. Improving the city for the citizen should be the main goal of development projects.
12	MTDB07JK	Including all three sectors and the way to manage it is the most important aspect of Smart City development

#	PARTICIPANT	MOTIVATION
14	MTDB13TH	It's important to find the users perspective. By not using this perspective in the development, the projects will eventually fail.
15	MTDB11JT	The key to successful development projects is security. Without security, there will be no positive future.
20	MTDB02MP	Technology is not the solution to the problems or the goal of the development, technology should have a supportive function towards specific goals.
	MTDB07JK	Technological innovation is beautiful, but it should always be a product of a common goal. It is about working together towards that common goal, where technology can help to get there.
	MTDB14EB	The human part should always be centred. Technologies should be used for their usefulness, on how it can contribute to a better quality of life.
	MTDB15PP	Experience from projects in the first decade of the HafenCity shows that tech-driven projects are not effective.
22	MTDB01PV	Transparency is essential. A Smart City is not about being a collection of 'shiny tech-objects', but about what you do with the technology to create something extra for the citizens.
	MTDB13TH	We live in a time where a lot of people want to engage in the decision-making process, everyone wants to get information. A Smart City creates the possibility of more transparent governing.
24	MTDB03RV	Intrinsic motivation should be the key driver for every initiative in the Smart City. Creating a value in an attempt to really make a difference for the people living in the city.
	MTDB06TH	Without trust, there will be no acceleration in the process and initiatives will not work. Innovation cannot work when there is no trust, since there need to be room for error and mistakes in the innovation process.

Table 6.4 summarizes the motivation the participants gave for placing a statement in the column of 'most disagree'. Again, the first column of the table is the number of the statement that it referred to, the second column is the corresponding participant code as given to each participant in the appendix, and the third column is a short version of the motivation the participant gave for their choices. The motivations are organized based on the statements.

Table 6.4 Motivation for the statements that are most disagreed with

#	PARTICIPANT	MOTIVATION
1	MTDB07JK	A technology push will never work when citizens just have to adapt to it. There should always be a choice.
2	MTDB03RV	Participation is about validating the desires of the public. The government should make decision based on that knowledge.
4	MTDB01PV	The Smart City should be about working together, a collaboration between different actors. Not just one should be responsible for the initiative.
	MTDB02MP	Both the private innovation platform as the city driven program initiatives can work. The focus should not be on only one of these.
	MTDB04CB	The government should decide about the structure of the Smart City, because their role is to represent the citizens. There is plenty of room for private input, as long as it fits within the framework set by the governmental organisations.
	MTDB11JT	It's about public goods, thus a part of the Smart City has to be city-driven. The private sector alone is not likely to act from the citizens' interest.

#	PARTICIPANT	MOTIVATION
	MTDB12FM	The Smart City is about the collaboration between the public sector, the private sector and the citizens.
	MTDB14EB	Focus on both private innovation platform and a city driven programme is essential. One cannot be defined as better, by definition.
	MTDB15PP	For HafenCity, regulation is a key instrument. City-driven programming is important to facilitate de-commodification.
7	MTDB11JT	Everything that has to do with innovation, cannot be limited to economic viability.
	MTDB12FM	It is unlikely that there is economic viability in innovative projects.
	MTDB13TH	When you only focus on economic viability, it stops little things from being tested. These little things can turn out to be equally important.
	MTDB14EB	Economic viability should not be the only thing to strive for. Other goals should matter as well.
9	MTDB02MP	Checking and monitoring citizens should not be the motivation for the Smart City.
12	MTDB06TH	Informing is the lowest level of citizen participation. It should not be about informing, but about active cooperation towards a common goal.
13	MTDB05WM	The focus should not be on restructuring, it definitely isn't a requirement for successful Smart City development.
16	MTDB01PV	Alliander has always put information security in a central position during their projects.
	MTDB03RV	It is the role of the government to protect the added value. This is not only economic value, but also social or Public value.
	MTDB04CB	Data security has always a central position in Smart City projects, and it should be like that. Information security is very important and all projects should be developed with the impact on privacy in mind.
17	MTDB15PP	Material and environment is not the only thing that is important. It is one-sided to ignore the economic and social aspects.
19	MTDB06TH	Bottom-up alone will not be enough. To collectively move forward, you have to find the perfect mix of bottom-up and top-down. One will not suffice.
23	MTDB05WM	This is a very top-down approach, like the Smart City is an entity on itself, almost a dictatorship. This is not what the Smart City should be.
	MTDB07JK	Solving traffic congestion should not be the focus of the Smart City. The solutions for these problems are already available, you don't need new technology for that.
	MTDB13TH	Cars are a part of the German Identity, you can't simply take that away from the citizens. Other ways to solve the problem of making people use public transportation more should be explored. The Smart City should not focus on this.

The qualitative data presented in the tables above will be used for the factor interpretation in the next chapter. The full description of the interviews is presented in Appendix V.

The data presented in the two tables above already shows that that there is no general consensus about the statements. Statement one and two, for example, appear as both totally agreed with and totally disagreed with. The tables also show that groups of participants do agree on some statements. For example, seven participants mostly disagreed with statement four and four participants mostly agreed with statement twenty.
The next chapter analyses these interviews in an attempt to formulate the different perspectives of the Smart City.

7. Q-Analysis

This chapter contains the analysis of the data, which is the fourth step of the Q-methodology. With this analysis, the answer to the third sub-question is given. The goal of this research question is to find different perspectives among actor in the two cities.
The first section of this chapter will give a summary of the analysis and presents the most important results. The next part will be the factor interpretation. This is a description of the perspectives that are filtered from the participants. The last part will advocate a possible application of the results.

7.1. Summary of the Q-analysis

The analysis is performed with the use of the program PQMethod. The main steps taken in this analysis, are described in chapter 3.6 Analysing the data (Q-analysis). The full results of the analysis are presented in Appendix VI. During the analytical process, some data specific decisions had to be made. These will be described and motivated next.

In the analysis, all 12 Q-sorts are used as one dataset; no city-specific analysis is conducted. This decision allows for revealing a perspective that is not city-specific, but maybe shares characteristics among governmental organisations or private companies. If there is a clear city-specific perspective of the Smart City, this perspective will also show up in the analysis of the complete set. Adding more data will not influence the revelation of a clear perspective. The relatively small dataset of 12 Q-sort is not likely to give a good representation of a city or actor group. Therefore, the results of the analysis will give a first impression of the Public values in the Smart City. The goal is not to prove that the perspectives found in the analysis are the only possibilities. The perspectives will also be named based on their content.

As mentioned in the description of the method (Chapter 3.6), four factors are extracted with the use of Centroid Factor Analysis. The third factor is not taken into account, because it has an initial eigenvalue of *0.1223*. After factor rotation, the EV was still smaller than one. Therefore, only three factors are used for the rotation process.

The *Varimax* method is used to rotate the factors automatically. After this process, visual evaluation concluded that there is no need for further (manual) rotation. The rotated factor matrix presented in Table 7.1 shows that all three factors are significant. Their EV's are with *3.1872*, *2.2998*, and *1.9797* respectively all conform the EV > 1 rule and all factors have at least two sorts with significant factor loadings (> *0.516*). In the table, the defining sort loadings are marked with an X. The factor-defining Q-sorts have a significant factor loading for only that specific factor. The Q-sort that is considered confounded has more than one significant factor loading.

Figure 7.1 shows plots of the data presented in Table 7.1. For each combination of two factors, the factor loadings together form the coordinates in the grid. The colours indicate the factor that the Q-sort is defining. As can be seen in the plots, the point with the same colours cluster around the axis it represents.

Table 7.1 Rotated Factor Matrix with an X Indicating a Defining Sort Loadings

QSORT	*Factor 1*	*Factor 2*	*Factor 3*
1 MTDB01PV	0.8120X	0.2512	0.2028
2 MTDB02MP	0.6525X	0.3854	0.3470
3 MTDB03RV	0.1378	0.2391	0.6429X
4 MTDB04CB	0.6039	0.5195	0.3763
5 MTDB05WM	0.7115X	0.1833	0.3322
6 MTDB06TH	0.2250	0.2399	0.8245X
7 MTDB07JK	0.4627X	0.0399	-0.0423
8 MTDB11JT	0.2646	0.5125X	0.3715
9 MTDB12FM	0.6025X	0.2922	0.2769
10 MTDB13TH	0.6577X	0.2734	0.4041
11 MTDB14EB	0.2038	0.7839X	0.2567
12 MTDB15PP	0.2009	0.7944X	0.1655
Eigenvalues	3.1872	2.2998	1.9797
% expl.Var.	27	19	16

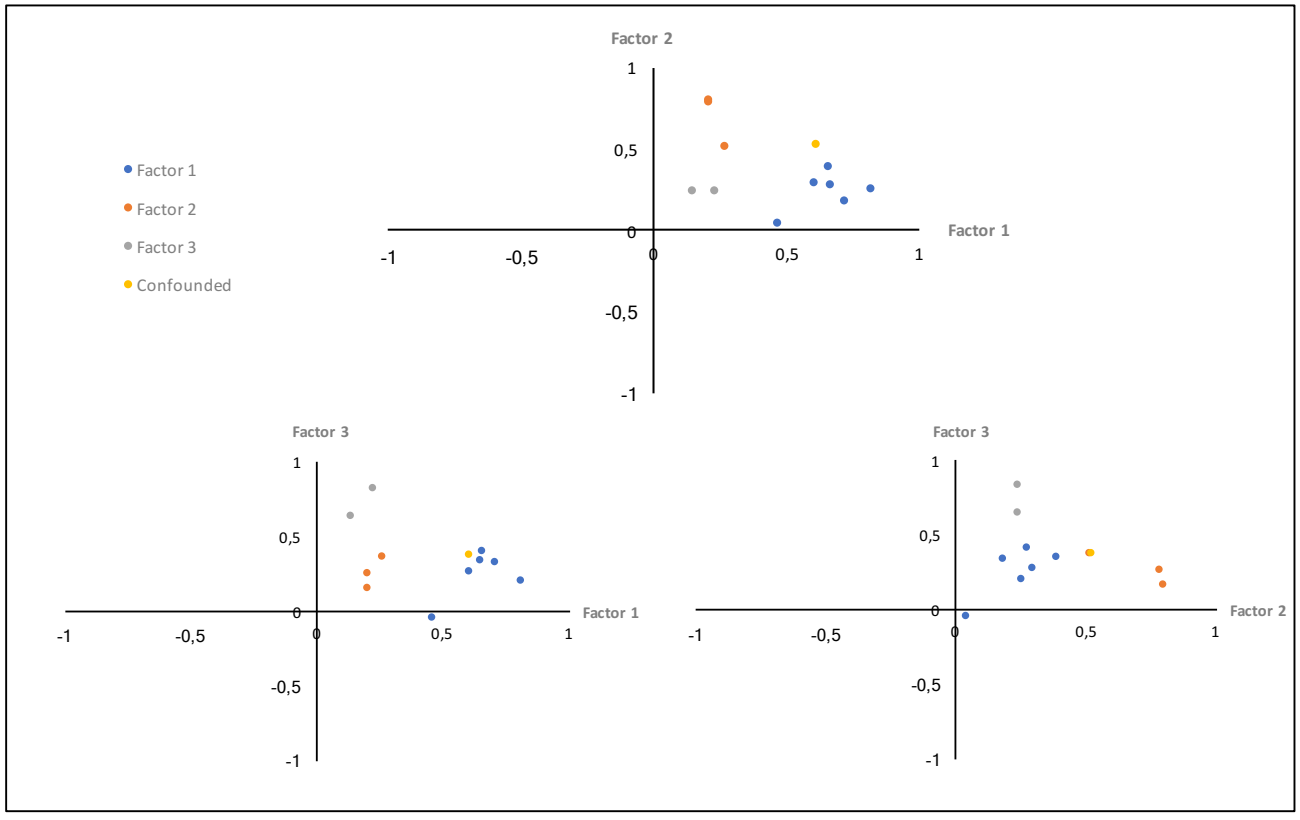


Figure 7.1 Plots of defining sort loadings after rotation

Table 7.2 below shows the Q-sorts that are represented in the factors.

Table 7.2 Factor-defining Q sorts

FACTOR NUMBER	Q SORT
1	MTDB01PV; MTDB02MP; MTDB05WM; MTDB07JK; MTDB12FM; MTDB13TH
2	MTDB11JT; MTDB14EB; MTDB15PP
3	MTDB03RV; MTDB06TH
CONFOUNDED	MTDB04CB
NON-SIGNIFICANT	-

The factor estimate calculation of PQMethod, which can be found in the full analysis in Appendix VI, resulted in the factor arrays presented in Table 7.3. The number in the table represent the statements from the Q-set and their score in the Q-sort.
The factor arrays are Q-sorts that show a common perspective on the situation. The next step is to interpret these Q-sorts and describe the perspective. This will be done for all three factors in the next section.

Table 7.3 Factor arrays

#	Factor 1	Factor 2	Factor 3	#	Factor 1	Factor 2	Factor 3
1	0	+1	+3	13	0	-2	-1
2	+3	0	0	14	+2	0	+1
3	0	+3	0	15	-1	+1	0
4	-3	-3	-1	16	-2	-1	-3
5	+1	0	+2	17	-1	-2	0
6	0	+2	0	18	+1	-1	+1
7	-2	-3	-2	19	+1	-2	-2
8	0	+1	+1	20	+2	+3	+2
9	-1	0	-1	21	+1	0	+1
10	+2	+2	+2	22	+3	+2	0
11	-2	-1	-2	23	-3	+1	-1
12	-1	-1	-3	24	0	0	+3

7.2.Factor interpretation

The factor interpretation is done individually for all three factors. For each factor, the Q-sort is presented in the same way as for the individual interviews (See Appendix V), a crib sheet is created, and a description of the factor's perspective is given. The crib also holds an extra section with "other statements of interest". These statements are considered to be relevant in defining the perspective, although they do not meet one of the other four criteria.
The factor interpretation is based on the qualitative data from the interviews and the position of the statements among each other in the factor specific Q-sort.

7.2.1. Interpretation of factor 1

Figure 7.2 shows the Q-sort of factor 1, as retrieved from the factor array presented in the previous section.

Factor 1

<-- Most disagree						Most agree -->
-3	-2	-1	0	1	2	3
4	7	9	1	5	10	2
23	11	12	3	18	14	22
	16	15	6	19	20	
		17	8	21		
			13			
			24			

Figure 7.2 Q-sort factor 1

Based on the Factor array and the Q-sort of factor 1, the crib sheet is created and presented in Table 7.4.

Table 7.4 Factor interpretation crib sheet for Factor 1

Items ranked at +3		
2	The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.	+3
22	Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.	+3
Items ranked higher in Factor 1 than in other factor arrays		
13	Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.	0
14	The Smart City governance should work closely with citizens, because this will accelerate Smart City development.	+2
19	A bottom-up methodology (open source data, where the input comes from the citizens and not from the companies) can provide the best results.	+1
Items ranked lower in Factor 1 than in other factor arrays		
1	'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.	0
8	Sharing and spreading the knowledge acquired during the path towards the Smart City transformation are actions of crucial importance.	0
15	The large number of interconnected devices in the Smart City require a central system of defence. Layered security approaches and transparent standards for privacy are crucial to the construction of smart cities.	-1

24	Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.	0
Items ranked at -3		
4	A Smart City initiative should come from a private innovation platform, not as a city driven program.	-3
23	The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.	-3
Other statements of interest		
20	The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.	+2
9	The Smart City should focus on the use of real-time information to respond rapidly to emergencies and threats, because the larger the population gets, the quicker the emergency response needs to be.	-2

The next step is to use all data to formulate a description of the factor. This full interpretation of factor 1 is presented below. The description refers to the statements by adding the number of the statement and the score between brackets, e.g. (2: +3) refers to statements 2 with a score of +3.

Full interpretation of Factor 1

Factor 1 has an eigenvalue of 3.1872 and explains 27% of the study variance. Six participants are significantly associated with this factor. Four of them are based in Amsterdam, two in Hamburg. The organisations that these participants represent are from all three parts of the triple helix. It includes a private company, knowledge institutions, and public research institutes that translate the public opinion.

In this perspective, the Smart City cannot be effective or successful without the participation of the public and their contribution with the government in making decisions (2: +3). The government should try to create support in public communities and dare to be open for new input. In this way, the key elements can be found and priorities can be set in the decision making. This will also empower the citizens in an attempt to create *Smart Citizens*, instead of only a Smart City. This bottom-up methodology, where the government works closely together with the citizens, will accelerate the development and create the best results (14: +2, 19: +1). Intrinsic motivation and trust do not play a particularly important role in this process, as long as the results are sufficient (24: 0). In some occasions (but definitely not always), restructuring of an area is required to achieve this goal (13: 0).
The technology in the city should be used to create transparency (22: +3). This transparency is essential, because it allows citizens to understand the purpose of the technological developments. Without this understanding, the Smart City is for the citizens just a collection of *shiny tech objects*. The technology should always be used to create an added value for the public, not just because it is a new innovation (20: +2). Technological developments should always be a product of a common good. The goal should be to create sustainable development, and technology can play an important role to get there. Pushing the technology will only have counter effects, people should have a choice whether or not they want it (1: 0).

Technology is <u>not</u> necessarily always the best option to solve urban challenges. Traffic congestion is an example of a problem that should not be the focus of the Smart City (23: -3). Using the Smart City concept to face challenges like this, creates a very top-down approach. Other policy instruments that are already available should be used to solve problems like this. It

indicates that the Smart City platform will not and should not always be used to solve all different types of problems. Emergency response is another example of a topic that should not necessarily be addressed by the Smart City (9: -2).
The initiative for the Smart City should not come from a private innovation platform, nor as a city-driven program (4: -3). The initiative should be a collaboration between the different actors in the city. Only when the public sector, the private sector, and the citizens agree on the approach, the Smart City can be effective.

Translated to Public values, the Smart City should be mainly focussed on citizen involvement and openness. The political-social (like citizen involvement and social innovation) and the utilitarian-instrumental (like openness) dimensions are considered most important for the Smart City. Sustainability is a utilitarian-Instrumental value that is considered less important. Values from the moral-ethical dimension, like secrecy and integrity, are also considered less relevant for the Smart City.

7.2.2. Interpretation of Factor 2

The steps towards the factor interpretation of factor one will be repeated for factor 2 and 3. Figure 7.3 shows the Q-sort of factor 2 and Table 7.5 shows the crib sheet for factor 2. This is followed by the full interpretation of factor 2.

Factor 2

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	13	11	2	1	6	3
9	17	12	5	8	10	20
	19	16	9	15	22	
		18	14	23		
			21			
			24			

Figure 7.3 Q-sort factor 2

Table 7.5 Factor interpretation crib sheet for Factor 2

Items ranked at +3		
3	We can only solve the challenges of urbanization by working closely with all of the players in politics and business.	+3
20	The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.	+3
Items ranked higher in Factor 2 than in other factor arrays		
6	Creativity is recognized as a key driver to Smart City, and thus people, education, learning and knowledge have central importance to Smart City.	+2
9	The Smart City should focus on the use of real-time information to respond rapidly to emergencies and threats, because the larger the population gets, the quicker the emergency response needs to be.	0
15	The large number of interconnected devices in the Smart City require a central system of defence. Layered security approaches and transparent standards for privacy are crucial to the construction of smart cities.	+1
16	Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.	-1
23	The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.	+1
Items ranked lower in Factor 2 than in other factor arrays		
5	Smart Cities are about working together, about cooperation, about collectively working towards a common goal.	0
13	Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.	-2
14	The Smart City governance should work closely with citizens, because this will accelerate Smart City development.	0
17	From a Smart City perspective, success within the domain of smart living can be achieved by providing environmental well-being, and material well-being.	-2
18	Because of the use of mobile applications to engage with citizens, there is a risk that the needs of low-income individuals, less-educated groups, the elderly, and others in need, that do not have smart devices and/or do not know how to use, them will be excluded.	-1
21	To make innovation succeed, openness in business is essential.	0
Items ranked at -3		
4	A Smart City initiative should come from a private innovation platform, not as a city driven program.	-3
7	In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.	-3
Other statements of interest		
10	Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.	+2

Full interpretation of Factor 2

Factor 2 has an eigenvalue of 2.2998 and explains 19% of the study variance. Three participants are significantly associated with this factor. The organisations that these participants represent are knowledge institutions and a publicly owned corporation.

In this perspective, sustainable development is the central goal of technological innovation in the Smart City (20: +3). Technologies should be used for their usefulness, on how it can contribute to a better quality of life. When the main focus is tech-driven, results from the past prove that projects are likely to fail. This sustainable development can be reached by constantly redefining the sustainability goals and setting new standards for projects. And it should be the human resource that is used to set these new standards (10: +2). Creativity is the key driven for this (6: +2).

It is also very important that there is a close cooperation between all players in politics and business (3: +3). When the two sectors have a difference in opinion about what is important for the city, it will obstruct further innovation. Only working closely together with the citizen will not be sufficient, it has to be a cooperation between all players (14: 0).

The effects of the Smart City are the main driver for the development, whether it is in emergency responses (9: 0), traffic congestion (23: 1), or information security (15: +1; 16: -1). Information security can even be seen as a key to success in projects, because there will be no positive future when security is not guaranteed. In creating these effects for the public, it is important to not only focus on the problem at hand, but also on other aspects that might be affected. Environmental projects should, for example, never ignore the economic and social aspects that it affects (17: -2). Openness in business is less important, when the results are sufficient (21: 0).

The Smart City should be a platform for innovation. Not only the most economic viable projects should be implemented, but there should also be a room for small innovative initiatives (7: -3; 13: -2). In fact, it is very unlikely to have innovation in an economically viable project. For innovation to succeed, there has to be room for failure. Innovation cannot be limited by economic viability.

The initiative for the Smart City should <u>not</u> come as a private innovation platform (4: -3). The Smart City is about creating public goods, which is not likely to be the focus of the private sector. The role of the government is to act from the citizens' interest, to guarantee that the projects in the city are aware of their effect on the people. The regulations set by the government are used as key instruments for sustainable development. It is, however, also not true that the Smart City initiative should be entirely city-driven. The past has proven that this approach will not work either.

Translated to Public values, the Smart City should mainly be focussed on the utilitarian-instrumental and the moral-ethical dimensions. The sustainability and robustness of the city are key performance indicators for the Smart City, but only when keeping an eye on the effects on secrecy and human dignity.

For the Smart City to succeed, the focus should not be too much on the hedonistic-esthetical dimension. Emphasizing cultural heritage or reliability of projects will slow down innovation and will therefore miss the main goal of the development as an end itself.

7.2.3. Interpretation of factor 3

This section presents the Q-sort of factor 3 in Figure 7.4 and the crib sheet for factor 3 in Table 7.6.

Factor 3

<-- Most disagree						Most agree -->
-3	-2	-1	0	1	2	3
12	7	4	2	8	5	1
16	11	9	3	14	10	24
	19	13	6	18	20	
		23	15	21		
			17			
			22			

Figure 7.4 Q-sort factor 3

Table 7.6 Factor interpretation crib sheet for Factor 3

Items ranked at +3		
1	'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.	+3
24	Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.	+3
Items ranked higher in Factor 3 than in other factor arrays		
4	A Smart City initiative should come from a private innovation platform, not as a city driven program.	-1
5	Smart Cities are about working together, about cooperation, about collectively working towards a common goal.	2
17	From a Smart City perspective, success within the domain of smart living can be achieved by providing environmental well-being, and material well-being.	0
Items ranked lower in Factor 3 than in other factor arrays		
22	Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.	0
Items ranked at -3		
12	All projects should be built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.	-3
16	Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.	-3
Other statements of interest		
19	A bottom-up methodology (open source data, where the input comes from the citizens and not from the companies) can provide the best results.	-2

Full interpretation of Factor 3

Factor 3 has an eigenvalue of 1.9797 and explains 16% of the study variance. Two participants are significantly associated with this factor. Both of them are from private organisations (or initiatives) that are involved in the Smart City of Amsterdam.

In this perspective, intrinsic motivation and trust among the stakeholders is key in tackling societal challenges and is therefore the main driver of the Smart City (24: +3). Intrinsic motivation should be the key driver for every initiative in the Smart City, because the projects should be about creating a value in an attempt to really make a difference for the people living in the city. And without trust among the stakeholders, there will be no acceleration in the process and initiatives will not work. Innovation cannot work when there is no trust, since there need to be room for error and mistakes in the innovation process. This trust is partly created by collectively working towards a common goal (5: +2). When working towards this common goal, a collective input is created and this is key in creating successful output. The problems that are faced can be seen as a big jigsaw-puzzle, where all stakeholders have a different piece of the puzzle. The solution can be found by combining the pieces of all stakeholders.
The results or effects of a top-down solution for urban challenges, like tech driven smart services (1: +3), fully depends on how the public citizens handle it. If the public doesn't want it, the solutions will be ineffective. This does not mean, however, that a bottom-up approach is best by definition (19: -2). To collectively move forward, the perfect mix of bottom-up and top-down has to be found, one will not suffice. This mix should also be represented in the initiative, that should come as a collaboration between public and private organisations (4: -1).

Citizen involvement does not mean that the Smart City should just inform the citizens about the developments (12: -3; 22: 0). The very top-down nature of informing is the lowest level of citizen participation. It should not be about informing, but about active cooperation towards a common goal. Working for people without involving them in the process, will actually result in working against them. It is about validating the desires of the public to facilitate knowledge based decision making.
Information security should always be of central interest of the government (16: -3). It is their duty to protect and guarantee the added value for the public. This added value should not only be focussed on the economic value, but also on social or Public value.

Translated to Public value, the Smart City should be mainly focussed on the moral-ethical dimension. Integrity is considered a key factor in successful development. Combining this with the political social value of citizen involvement and equal opportunities, creates a future-proof base for innovation.
The Smart City should focus less on the hedonistic-esthetical dimension. The service quality should not be the main focus of projects, since this will decelerate the development and prevent innovation.

7.3. Perspectives on Smart City development

This section gives a summary of the three perspectives filtered from the data and also gives the perspectives a name. The path towards these perspectives is elaborated in the previous sections.

Factor 1: Creating Smart Citizens, not a Smart City

In the vision of 'Creating Smart Citizens, not a Smart City', the Smart City cannot be effective or successful without the participation of the public and their contribution with the government in making decisions. The goal is to empower the citizens in an attempt to create *Smart Citizens*, instead of only a Smart City. This bottom-up methodology, where the government works closely together with the citizens, will accelerate the development and create the best results. Transparency in development is essential, because it allows citizens to understand the purpose of the technological developments. Without this understanding, the Smart City is for the citizens just a collection of *shiny tech objects*. The Smart City platform will not and should not always be used to solve all different type of problems.

The initiative for the Smart City should be a collaboration between the different actors in the city. Only when the public sector, the private sector, and the citizens agree on the approach, the Smart City can be effective and will the projects succeed.

Thus, the Smart City developments should be mainly focussed on citizen involvement and openness. The political-social (like citizen involvement and social innovation) dimension is most dominantly presented, followed by the utilitarian-instrumental (like openness) dimension. Sustainability is a utilitarian-instrumental value that is considered less important. Values from the moral-ethical dimension, like secrecy and integrity, are also considered less relevant for the Smart City.

Factor 2: Sustainability as a key driver

In the vision of 'Sustainability as a key driven', sustainable development is the central goal of technological innovation in the Smart City. Where sustainability is defined as 'the ability of the technological innovation to last over time in an efficient manner'. Technologies should be used for their usefulness, on how it can contribute to a better quality of life. This sustainable development can be reached by constantly redefining the sustainability goals and setting new standard for projects. It is also very important that there is a close cooperation between all players in politics and business. The effects of the Smart City, in aspects like emergency responses or information security, are the main driver for the development. In creating effects for the public, it is important to not only focus on the problem at hand, but also on other aspects that might be affected.

The Smart City should be a platform for innovation. For innovation to succeed, there has to be room for failure. Innovation cannot be limited by economic viability.

The initiative for the Smart City should not come as a private innovation platform. The role of the government is acting from the citizens' interest, to guarantee that the projects in the city are aware of their effect on the people. It is also not true that the Smart City initiative should be entirely city-driven. The past has proven that this approach will not work either.

Thus, the main focus should be on the utilitarian-instrumental dimension and also keep in mind the moral-ethical dimension. The sustainability and robustness of the city are key performance indicators for the Smart City, but only when keeping an eye on the effects on secrecy and human dignity. The focus should not be too much on the hedonistic-esthetical dimension. This means that emphasizing cultural heritage or reliability of projects will slow down innovation and will therefore miss the main goal of the development as an end itself.

Factor 3: No acceleration without trust

In the vision of 'No acceleration without trust', intrinsic motivation and trust among the stakeholders is key in tackling societal challenges and is therefore the main driver of the Smart City. When working towards this common goal, a collective input is created and this is key in creating successful output. The result/effect of top-down approaches as solutions for urban challenges fully depends on how the public citizens handle it. If the public doesn't want it, the solutions will be ineffective. To collectively move forward, a perfect mix of bottom-up and top-down has to be found, one will not suffice.

The Smart City projects should not just inform the citizens about the developments, but actively cooperate towards a common goal. This is about validating the desires of the public to facilitate knowledge based decision making. It is the duty of the central government to protect and guarantee the added value for the public. This added value should not only be focussed on the economic value, but also on social or Public value.

Thus, the Smart City development should be mainly focussed on the moral-ethical dimension. Integrity is considered a key factor in successful development. Combining this with the political-social values of citizen involvement and equal opportunities, creates a future-proof base for innovation. The Smart City should focus less on the hedonistic-esthetical dimension. The service quality should not be the main focus of projects, since this will decelerate the development and prevent innovation.

7.4. Applications of the results

This section contains conclusions that can be taken from the analysis. The goal of these conclusions is to find the possible effect that the different perspectives of Public values had/have on the decision-making in the Smart Cities of Amsterdam and Hamburg. This section will start with a short review of how the Smart Cities of Amsterdam and Hamburg are designed.

7.4.1. Reformulation of the Smart Cities

The Smart City concept is implemented in two different ways in the cities of Amsterdam and Hamburg. Amsterdam is characterised by the public-private-partnership, where the main focus is on the creation of a platform that enables cooperation between different sectors. Projects that cooperate 'in a smart way' via this platform, and with that try to improve the quality of life in the city, are considered Smart City projects. When looking at the Smart City development stages presented by Van Dijk *et al.* (2015), Amsterdam is currently in the third stage of development, "Integral". The strategy and projects in the Smart City of Amsterdam are integral and cohesive citywide. The coordination of the Amsterdam Smart City platform plays an important role in this process. Also in the domains of Openness and Ecosystem is Amsterdam in the third stage. New ways of collaboration are created and the government is becoming part of a creative public-private ecosystem. In the domains of Data and Technology Amsterdam is still in the second stage of development. The Smart City of Amsterdam is not focussed on only using technological innovation as solutions, but focusses more on collaboration and working towards a common goal.

In Hamburg, the Smart City is mainly used as a label to communicate large development projects. Two of biggest projects are the HafenCity, which is the world's largest inner-city development project, and the transformation of the port of Hamburg to a 'Smart Port'. Most of the projects and developments in the city that are referred to as Smart City projects are state-led; the initiatives in the Smart City come from public organisations or publicly owned corporations (like HafenCity Hamburg GmbH). However, large IT companies do also claim an important position in the network by making the development projects a test-site for their technological innovation. When looking at the Smart City development stages presented by Van Dijk *et al.* (2015), Hamburg is currently in the process of shifting from the first to the second stage of development, "Initial" to "Intentional". The increasing awareness of user involvement and city-wide development projects put Hamburg in stage two for the first two domains *Strategy & Vision* and *Projects & Solutions*. Also in the domain of *Competences* Hamburg is currently in the second stage. In the domains of *Data* and *Technology* however, the city is still in the "Initial" stage with closed data and traditional processes. The transition from the first stage to the second is visible in the domains *Openness* and *Ecosystem*. The growing awareness of the need for risks and the openness of the government to work with external parties (like in the MoU) place Hamburg in development stage two, but the focus on internal buy-ins and attempts to match technology push with existing policies are characteristics of the first stage of development.

A schematic motivation of the placement of the factors and cities in one of the stages of development is presented in Appendix VII.

7.4.2. Placing the factors in the Public value landscape

In these two cities, three different perspectives of Public value in the Smart City can be derived. The first one is the vision of 'Creating Smart Citizens, not a Smart City', where the main focus is the political-social dimension of value. The second one is the vision of 'Sustainability as a key driver', where the main focus is on the utilitarian-instrumental dimension of value. The third and last perspective is the vision of 'No acceleration without trust', where the moral-ethical dimension of value is most important. Figure 7.5 shows the positions of the factors in the Public value framework by Meynhardt (2009).

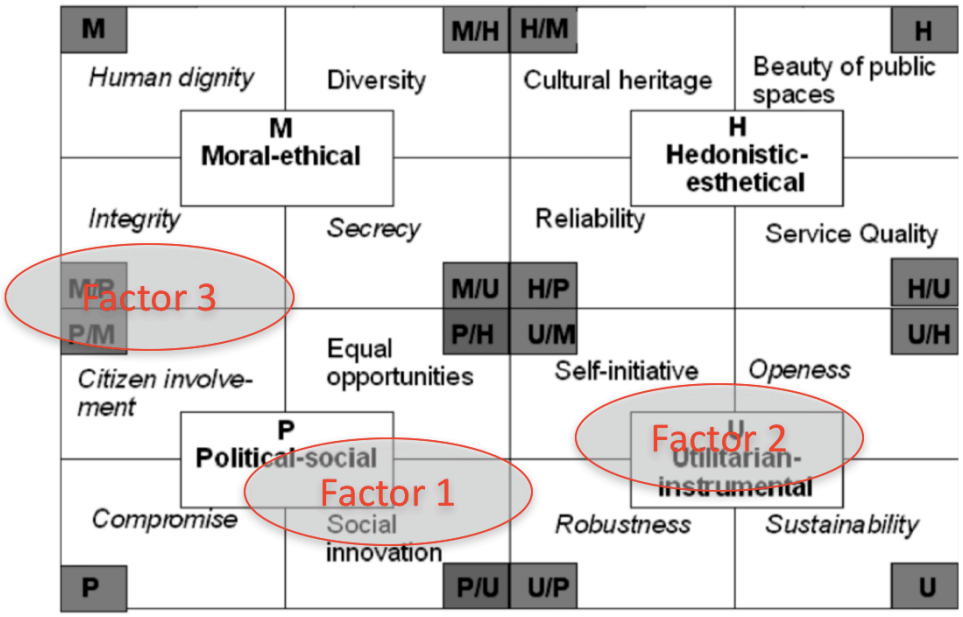


Figure 7.5 Placement of factors in Public value framework by Meynhardt (2009)

7.4.3. Applications for decision-making

With the results of the analysis the main research question can be answered, which will be done in the next chapter. Before moving to the conclusions of this report, this section will explore a possible application for the results.
The results of the analysis show three different perspectives of the Smart City, based on Public values. One way of translating this relatively abstract conclusion to a practical application, is by placing the perspectives in the Smart City Maturity model by Van Dijk *et al.* (2015). Note that this is a professional contribution and that the use of this model solely shows a possible practical application for the conclusion that can be used by decision-makers. This application will not be part of the main conclusion of this research, since it is not based on peer-reviewed scientific contribution or empirical verification.

The perspective, or factors, presented in this research match the development stages from the Smart City Maturity model by Van Dijk *et al.* (2015). Factor 1: "Creating Smart Citizens, not a Smart City" has characteristics from the third stage, "Integral". In the domain of Strategy & Vision the user-centric strategy and the consulting of users and stakeholders can be found in factor 1 and in the third stage of development. The same goes for the domain Openness, where emerging new ways of collaboration is characteristic and for the domain Ecosystem, where parties are working together in a public-private ecosystem define the Smart Cities. With all these characteristics present in Factor 1, it is assumed that actors sharing the factor 1 perspective see the Smart City as being in the third stage of development. Factor 2: "Sustainability as a key driver" shows similarities with the second stage of development, "Intentional". In the domain of Strategy & Vision factor 2 is represented by the counterweight to technology push and by the strategy shifting from internal efficiency to user centricity. In the domain Ecosystem, the growing internal and external collaboration and the government starting to be more open for new ways of working together place factor 2 in the second stage of development. It is assumed that actors sharing the factor 2 perspective see the Smart City as being in the second stage of development. Factor 3: "No acceleration without trust" is considered a perspective of the fourth and last stage of Smart City development, "Transformed". Especially for the domain Openness, the moral values attached to factor 3 are visible. Also for the Strategy & Vision, the continuous optimization and user-centric success realization are characteristics that place factor 3 in the fourth stage of development. It is assumed that actors sharing the factor 3 perspective see the Smart City as being in the fourth stage of development.

Translating this conclusion to the cities under study in this research, it might be possible to match the perspectives of the actors in a city with its stage of development. Amsterdam is currently in the third stage of development. This means that the dedicated actors view the Smart City from the perspective of factor 1. This can also be seen in the analysis, where 57% (4 out of 7) of the participants from Amsterdam share this perspective. Two actors in Amsterdam share the perspective from Factor 3, which means that they tend to see the Smart City as being in the fourth stage of development.
Hamburg is currently shifting towards the second stage of development, the stage of development that is represented by factor 2. The analysis also show that 60% (3 out of 5) of the participants from Hamburg share this perspective. Two actors in Hamburg share the perspective from Factor 1, which means that they tend to see the Smart City as being in the third stage of development.

A schematic motivation of the placement of the factors and cities in one of the stages of development is presented in Appendix VII.

8. Conclusions & Discussion

The final chapter contains a summary of all the conclusions from this research. By summing up these conclusions, all research-questions are answered chronologically. Every sub question will be repeated briefly and answered in a conclusive way. It will also refer to the location where the questions are answered in more detail. The answers to the sub research questions to not present new information in this chapter. The main research question will be answered based on the other answers.
This chapter also includes the last remarks about this research. It gives recommendations based on the conclusions, the scientific relevance of the conclusion is emphasized, it lists the limitations of this research, it suggests future research, and finally it evaluates the Q-methodology.

8.1. Answering the research questions

The **first sub-question** is a theoretical framework towards the Q-set (i.e. the list of statements used in the interviews). The goal of this research question is to define Public value and explicate the use of this term in the Smart City development. The first sub-question is: SQ1. "What Public values can influence the Smart City Implementation?", which is split into the three questions SQ1.1 "What are Public values?", SQ1.2 "How can Public values be measured in Smart City development?", and SQ1.3 "What explicit Public value statements are made in the discourse about City development?".
The answer to SQ1.1 is found with the use of a literature review on Public value and Public value in Smart City development. The literature shows ambiguity on the exact definition of Public value, depending on the sector it is used it. For this research, Public value is defined as a product of public policy. The working definition for Public value in this research is: "*Public value is the positive effect on social welfare for the citizens or society created by specifically focused public policy"*. And as a more specific definition, Public value in Smart City development is defined as: "*The added value that is created for the citizens or society by the Smart City initiatives and projects".*
SQ1.2 is found by comparing different theories and model on Public value mapping. To measure the Public values in a Smart City in this research, the landscape of Public values created by Meynhardt (2009) is used. The landscape divides Public value over 4 dimensions: (1) Moral-ethical, (2) Hedonistic-esthetical, (3) Political-social, and (4) Utilitarian-Instrumental. These dimensions each contain 4 values.
Based on the Public value landscape, of list of 70 statements about Public value and Smart City development is extracted from the political discourse and the literature. This list is shortened to the list of 24 statements as the Q-set (i.e. the statements used in the Q-analysis). Table 4.1 presents this Q-set, which is the answer to SQ1.3.
A more detailed explanation of these answers can be found in Chapters 2 and 4.

The **second sub-question** is about the actors involved. The goal of this research question is to find the dedicated actors in the Smart Cities of Amsterdam and Hamburg, that fit the profile to be participants in this Q-study. This list of actors is in Q-methodology referred to as the P-sample. The second sub-question is: SQ2. "Who are the dedicated actors in the Smart City development?", which is split into the two questions SQ2.1 "Who are the dedicated actors in the Smart City of Amsterdam?", and SQ2.2 "Who are the dedicated actors in the Smart City of Hamburg?".
After the seven steps of the actor analysis by Enserink *et al.* (2015) have been completed, the dedicated actors in both cities are found based on their position in the network, their resources, and their willingness to use these resources. The dedicated actors in Amsterdam are: *Amsterdam Economic Board, Amsterdam Smart City Platform, Citizen Data Lab, CTO Amsterdam, Focus groups, Hogeschool van Amsterdam, Pakhuis de Zwijger,* and *WAAG Society*. In Hamburg, the dedicated actors are: *CISCO*,

HafenCity Hamburg, *HAW*, *HCU*, *HHLA*, *MLOVE*, and *UH*. All dedicated actors are contacted to be part of the P-sample (i.e. the list of participants).
A more detailed explanation of these answers can be found in Chapter 5.

The answer to the **third sub-question** is the result of the Q-analysis. The goal of this research question is to find different perspectives among actor in the two cities. The third sub-question is: SQ3. "What are the different perspectives of Public values in Smart City decision-making?"
The Q-analysis performed over the 12 interviews from this research resulted in the formulation of three different perspectives of the Smart City. The perspectives are called: 'Factor 1: Creating Smart Citizens, not a Smart City', 'Factor 2: Sustainability as a key driver', and 'Factor 3: No acceleration without trust'. The first factor is mainly focussing on the political-social dimension of Public value, with values like citizen involvement and social innovation as main drivers. The second factor is mainly focussing on the utilitarian-instrumental dimension of Public value, with values like sustainability and robustness as main drivers. The third factor is mainly focussing on the moral-ethical dimension of Public value, with the value integrity as main driver.
A more detailed explanation of these answers can be found in Chapter 7.

The **main research question** of this study is a combination of all sub-questions. The answer to this question entails the all main findings in this research. The main research question is: "*What Public values are used in decision-making for Smart City implementation, based on the Amsterdam and Hamburg examples?"*
Based on the analysis of the different perspectives of the stakeholders on the Smart City, the decision-making in the Smart City is using one of three different sets of Public values. The decisions are based on either (1) the Political-social dimension with *citizen involvement* and *social innovation* as main values, (2) the Utilitarian-instrumental dimension with *sustainability* and *robustness* as main drivers, or (3) the Moral-ethical dimension with the value *integrity* as main driver. The decisions for Smart City development are based on one of these three sets of values. Actors in the Smart City development discourse should be aware of these different perspectives, and use this knowledge to come to a collaborative solution. This will stimulate the effectiveness of the policy and projects and allows for more sustainable development.

8.2.Recommendation

Based on the results of this research, a recommendation can be made to cities that are implementing the Smart City concept. The results of this research provide an understanding of possible perspectives on the Smart City by its involved actors, based on Public value. Knowledge about these perspectives can be used to specifically target certain values and with that, create policy and projects that are much more effective. Any Smart City can expect to have actors that share at least one of the three perspectives of Public value in the Smart City presented in this research. Consequently, awareness of these perspectives can allow for a better and faster understanding of the Public values that are important to the actors in the Smart City.

A more city specific recommendation can also be given, based on the results of the interviews. It is recommended that the Smart City projects in Amsterdam put more focus on creating an actual added value for the public. Several actors agree that this can only be achieved with active participation of the public and openness and transparency of the policies. The participation should be used to identify the key desires of the public, and the openness should serve the goal of lowering the gap between citizens and authorities. The Smart City Platform is a good example of a development in the right direction, although it is not yet using its full potential of citizen engagement.
In Hamburg, the Smart City should also put more emphasis on the human side of the equation. It is a common voice among the actors involved that the effects of the projects in terms of social and Public value are greatly underestimated. Even though it should be considered equally important as economic results. Focussing more on the human side of the projects, will allow for more sustainable development and social acceptance of the developments.

8.3.Scientific relevance of the conclusions

The research presented in this report focussed on finding a way to determine the Public values that are considered important in a Smart City. This is follow-up study on the paper "Urban experimentation and institutional arrangements" by Raven *et al.* (2017), where different Smart Cities are showed based on different elements (e.g. regulative, normative, and cognitive). The normative elements that define a Smart City are further explored in this research. The scientific contribution of this research can be split in three main parts, the understanding of Smart City development as a part of the field of City Branding (in either urban-development or political sciences), the basic understanding of Public value as part of the social sciences field, and the strength of the Q-methodology for policy analysis. The three parts are emphasised separately.

This research contributes to the understanding of Smart City development by explaining the normative elements that define the Smart City based on empirical research. The qualitative research conducted in this study evaluated the importance of certain Public values in the decision-making for Smart City development. This is the first time that Public values are empirically connected to Smart City development. The main contribution of this research is the formulation of three perspectives of Public value in the Smart City. Even though the perspectives cannot be connected to specific cities or groups of actors, it does provide a better understanding of how the Public values affect the Smart City development. It can be expected that at least one of these perspectives is shared by actors from any other Smart Cities around the world and therefore provide a starting point for policy based on the Public values. This will allow for more efficient and effective Smart City development. Another contribution to the understanding of Smart City development is more city-specific. The results of the research provide a clear description of the Smart Cities of Amsterdam and Hamburg based on the Public values that have a central role in the development process. The research also presents an actor analysis including a formal relation network chart for both cities. Both provide a better understanding of the two Smart Cities as they are at this moment.

The contribution to the basic understanding of Public value is mainly present in the way the Public values are used as means, instead of only as a result. Public values are always an underlying motive of a political decision, but are rarely consciously considered beforehand. The research showed that actors working on the same Smart City project can have a different opinion about the Public values that are important. Therefore, using these Public values as a means in policy-making may prevent conflict or obstruction later on in the process. Redefining Public values as a means for policy-making opens a new

perspective on the term. Public value should not only be used as a measurement for the effect of the policy, it should rather be considered as a performance indicator throughout the whole project. Constant monitoring of the emphasis that is put on the specific Public values creates an environment where the social effect is considered equally importance as the economic benefit of the project.
The research also adds to the discovering of capabilities of the Q-method. The Q-methodology is for this research an effective way of finding perspectives on Smart City development. The method allows for a relatively small number of respondent, which will usually be the case when analysing a specific policy. It also provided a way to define different perspectives without prior knowledge or bias of the formal or informal relations in the Smart City. Participants can share the same perspectives of Public values with someone they never expected to be related with. A more detailed evaluation of the Q-methodology is provided in section 8.6.

8.4.Limitations

The main limitation of this research is that a relatively small portion of the stakeholders involved in the Smart City development in both cities are interviewed. Interviewing other organisations can picture a completely new perspective of the situation. However, this new perspective of the Smart City will not affect the perspectives that are already formulated.
Another limitation of this research is the interpretation of the Public values. The statements are all formed around specific Public values. Even though the classification is theoretically based, one could argue that some statements can be interpreted as a translation of another value. This will mutate the results and potentially the conclusion. This is, however, part of the set of assumptions in research that need to be made in every study.

8.5.Future research

The scientific relevance and the limitations of this research create an opportunity for further research. Future research can use this study as a base to start from, or as an insight for exploring new possibilities.
A possibility for future research on the topic of Smart City development can focus on other cities that implement the Smart City concept. Applying the same method to other cities and comparing the results, can potentially create a categorisation of perspectives on Public value in all Smart City developments. The categorisation could potentially correlate with culture, although this would require a cultural and institutional sensitive research which the study presented in this report is not.
Another possible topic of future research is about the effectiveness of Smart City projects that focus on specific Public values. The results of the projects can be evaluated and compared with projects focussing on other values or no value at all. A difference in performance can motivate the importance of specific values in the city.

Future research can also try to contribute to the understanding of Public values, by attempting to find the effect that the different perspectives of Public values had or can have on the decision-making in the Smart Cities. By asking the question “What effect can the different perspectives of Public values on decision-making have in the Smart City implementation?”, for example. The Smart City maturity model by Van Dijk *et al.* (2015) is used in this research as an application for the results. This application can be studied further to see if the maturity model provides a representative base for research, and to see if the gathered knowledge on Public value can help with Smart City development. The study can try to find a recommendation for decision-making based on that application for the results, meaning that the decision-making process for Smart City development will be linked to the four stages of Smart City development. Future research can attempt to empirically motivate the connection of Public value

perspectives to development phases. This might also open the door for policy-advice to cities that have the ambition to grow in their Smart City maturity. When there is empirical evidence that the perspectives of Public value in the Smart City are connected to the stage of development, and not to the personal beliefs of an actor, changing the perspectives of the actors can over time increase the maturity of the Smart City.

8.6. Evaluation of the Q-methodology

In this interpretation of the Q-methodology, a relatively small number of statements (24) and Q-sorts (12) is used. All Q-sort are retrieved in a one-on-one interview, to guarantee sufficient qualitative input. The participants are all well-educated.

For the interviews, all statements were printed on business-card sized cards. The cards were handed to the participants one by one for them to make the first split between the statements. Before handing them out, the Q-sort distribution that had to be made in the end was presented and explained. All participants were advised to make three stacks (agree, neutral, and disagree), but were left free to use a method that they found most suitable.

Only two of the participants followed the advice of making three stacks of cards. Other methods that were used during this first split are: (1) Splitting the cards in three stacks, but places the cards underneath each other in a way that all cards remained visible; (2) Splitting the cards in more than three (five, six, or even eight) categories while keeping all the cards visible; and (3) Using the scores on the distribution (-3 to +3) to score every card in this range. The first two new methods turned out to be very effective, because it allows for a constant overview of all statements and it also distinguishes the statements among each other in the first split. Participants that used one of these methods, were much faster in creating the distribution in the Q-sort. The participant that used the third new method (using the scores), were less effective in creating the final Q-sort. This is likely to be caused by the initial interpretation of the statements. They already assigned a score to the statements, and then they had to reconsider that score by placing the statement in a different group. Even though the position of the statements among each other did not change, it felt like an intrinsic disagreement with the result.

When asking the participants how they feel about the method, the responses were positive. Distributing the statements was easier than they expected. Not spending too much time on every statement made the participant base their judgement on their first intuitive impression. Discussing the statement for a long time might create a different outcome, but definitely not a better one. Some participants made it a game for themselves to slide the cards over the table in a way that it would match the Q-sort distribution. The researchers that were interviewed were all unfamiliar with this method, but were positively surprised by the ease of which it can create cooperation from the participant.
Other participants, especially from private organisations, were very happy to cooperate in this research, because it allowed them to reconsider what they are actually doing in their every day job. Talking about different values inspired them to focus more on creating an added value in their projects.
Q-studies with a Q-set that is much bigger than 24 are not likely to show the same results. A large number of statements will at a certain point lose the overview and add a random factor to the distributions. At statement number 54, for example, the participant is likely to place it “somewhere over here”. With a smaller Q-set, it is much easier to create a fun experience while a qualitative result can still be guaranteed.

9. References

Ahvenniemi, H., Huovila, A., Pinto-Seppä, I., & Airaksinen, M. (2017). What are the differences between sustainable and smart cities? *Cities*, *60*, 234–245. https://doi.org/10.1016/j.cities.2016.09.009

Angelidou, M. (2016). Four European Smart City Strategies. *International Journal of Social Science Studies*, *4*(4), 18–30. https://doi.org/10.11114/ijsss.v4i4.1364

Anthopoulos, L. G. (2017). *Understanding Smart Cities: A Tool for Smart Government or an Industrial Trick?* (Vol. 22). Springer International Publishing AG. https://doi.org/10.1007/978-3-319-57015-0

Anttiroiko, A.-V. (2015). Smart Cities: Building Platforms for Innovative Local Economic Restructuring. In *Transforming City Governments for Successful Smart Cities* (pp. 23–41).

Beck Jørgensen, T., & Bozeman, B. (2007). Public values. An Inventory. Administration and Society, 39 (3), 354–381.

Bisello, A., Vettorato, D., Stephens, R., & Elisei, P. (2015). *Smart and sustainable planning for cities and regions*. *Smart and Sustainable Planning for Cities and Regions*.

Bozeman, B. (2007) Public values and Public Interest: Counter-balancing Economic Individualism. Washington, D.C.: Georgetown University Press.

Bozeman, B., & Sarewitz, D. (2011). Public value Mapping and Science Policy Evaluation. *Minerva*, *49*(1), 1–23. https://doi.org/10.1007/s11024-011-9161-7

Braun, E., Eshuis, J., Klijn, E. H., & Zenker, S. (2017). Improving place reputation: Do an open place brand process and an identity-image match pay off? *Cities*, (June), 0–1. https://doi.org/10.1016/j.cities.2017.06.010

Braun, E., Eshuis, J., Klijn, E.-H., & Zenker, S. (2017). Improving place reputation: Do an open place brand process and an identity-image match pay off? *Cities*. https://doi.org/https://doi.org/10.1016/j.cities.2017.06.010

Braun, T., Fung, B. C. M., Iqbal, F., & Shah, B. (2018). Security and privacy challenges in smart cities. *Sustainable Cities and Society*, *39*(March), 499–507. https://doi.org/10.1016/j.scs.2018.02.039

Brown, S. R. (1980). *Political Subjectivity: Application of Q Methodology in Political Science*. New Haven and London, Yale University Press.

Capra, C. F. (2014). *The Smart City and its Citizens: Governance and Citizen Participation in Amsterdam Smart City*. Erasmun University Rotterdam.

Centraal Bureau voor de Statistiek (CBS) (2018). Bevolkingsontwikkeling; regio per maand. Den Haag / Heerlen. Retrieved July 13, 2018, from http://statline.cbs.nl/Statweb/publication/?DM=SLNL&PA=37230ned&D1=17&D2=39,77&D3=76,89,102,115,128,141,154,167,180,193,195-196&HDR=G2&STB=G1,T&VW=T

Chanut, V., Chomienne, H., & Desmarais, C. (2015). Value practices and public management. *International Review of Administrative Sciences*, *81*(2), 219–226. https://doi.org/10.1177/0020852315579397

Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J., Mellouli, S., Nahon, K., … Sholl, H. J. (2012). Understanding Smart Cities: An Integrative Framework. In *45th Hawaii International Conference on System Sciences* (pp. 2289–2297). https://doi.org/10.1109/HICSS.2012.615

Cisco (2014). City of Hamburg and Cisco Launch Plans for Smart City of the Future and Lay Foundation for a Partner Ecosystem. Retrieved July 16 2018 from https://newsroom.cisco.com/press-release-content?type=webcontent&articleId=1414144

Cisco International Limited (Cisco) & Freie und Hansestadt Hamburg (City of Hamburg) (2014). Memorandum of Understanding. Available at http://www.hamburg.de/contentblob/4306466/67e750a4c1ad1f61b0f1026d8775c91f/data/download-memorandum.pdf;jsessionid=6B8BE855F38432F127C8EEC8579249A2.liveWorker2

City of Hamburg. (2017). Hamburg SmartCity, (January).

Cuppen, E. (2010). *Putting Perspectives into Participation*. Uitgeverij BOXPress, Oisterwijk. Retrieved from https://www.publicspaceinfo.nl/media/uploads/files/CUPPEN_2010_0001.pdf%5Cnhttp://dare.ubvu.vu.nl/handle/1871/15611

Daalhof, C. (2016). Transitie naar Smart cities. Retrieved April 30, 2018, from http://www.bouwinontwikkeling.nl/gebiedsontwikkeling/transitie-naar-smart-cities

Dameri, R. P., Negre, E., & Rosenthal-Sabroux, C. (2016). Triple Helix in smart cities: A literature review about the vision of public bodies, universities, and private companies. *Proceedings of the Annual Hawaii International Conference on System Sciences*, *2016–March*, 2974–2982. https://doi.org/10.1109/HICSS.2016.372

David, N., Justice, J., & McNutt, J. G. (2015). Smart Cities Are Transparent Cities: The Role of Fiscal Transparency in Smart City Governance. In M. P. Rodríguez-Bolívar (Ed.), *Transforming City Governments for Successful Smart Cities* (pp. 69–86). Springer International Publishing Switzerland.

de Bruijn, H., & Dicke, W. (2006). Strategies for safeguarding Public values in liberalized utility sectors. *Public Administration*, *84*(3), 717–735. https://doi.org/10.1111/j.1467-9299.2006.00609.x

de Jong, M., Chen, Y., Joss, S., Lu, H., Zhao, M., Yang, Q., & Zhang, C. (2018). Explaining City Branding practices in China's three mega-city regions: The role of ecological modernization. *Journal of Cleaner Production*, *179*, 527–543. https://doi.org/10.1016/j.jclepro.2018.01.098

de Oliveira, A. D. (2016). The Human Smart Cities Manifesto: A Global Perspective. In G. Concilio & F. Rizzo (Eds.), *Human Smart Cities: Rethinking the Interplay between Design and Planning* (pp. 197–202). Springer International Publishing Switzerland.

Dutta, S., Lanvin, B., Wunsch-Vincent, S. (2018). GLOBAL INNOVATION INDEX 2018: Energizing the World with Innovation. Cornell University.

Dutch Government. (2017). NL Smart City Strategie: The Future of Living.

Eco. (2017). eco and ADL Publish the Most Comprehensive Smart City Study to Date. Retrieved May 2, 2018, from https://international.eco.de/2017/news/eco-and-adl-publish-the-most-comprehensive-smart-city-study-to-date.html

Eco. (2018). Industry and Politics Discuss Smart City Hamburg. Retrieved May 2, 2018, from https://international.eco.de/2018/news/industry-and-politics-discuss-smart-city-hamburg.html

European Commission (2016). European Capital of Innovation (iCapital) 2016. Retrieved July 13, 2018, from https://ec.europa.eu/info/research-and-innovation/funding/funding-opportunities/prizes/icapital/icapital2016_en

Enserink, B., Hermans, L., Kwakkel, J., Thissen, W., Koppenjan, J., & Bots, P. (2010). *Policy analysis of multi-actor systems*. Lemma, The Hague.

Faulkner, N., & Kaufman, S. (2017). Avoiding Theoretical Stagnation: A Systematic Review and Framework for Measuring Public value. *Australian Journal of Public Administration*, *77*(1), 69–86. https://doi.org/10.1111/1467-8500.12251

Friedman, B., Kahn Jr., P. H., & Borning, A. (2006). Value Sensitive Design and Information Systems. *Human-Computer Interaction and Management Information Systems: Foundations*, 1–27. https://doi.org/10.1145/242485.242493

Gaus, G. F. (1990). *Value and justification: The foundations of liberal theory*. Cambridge University Press.

Geonames (2018). Germany – Largest Cities. Geonames.org. Retrieved July 15, 2018, from http://www.geonames.org/DE/largest-cities-in-germany.html

Gilbert Silvius, A. J., Kampinga, M., Paniagua, S., & Mooi, H. (2017). Considering sustainability in project management decision making; An investigation using Q-methodology. *International Journal of Project Management*, *35*(6), 1133–1150. https://doi.org/10.1016/j.ijproman.2017.01.011

Goess, S., de Jong, M., & Meijers, E. (2016). City Branding in polycentric urban regions: identification, profiling and transformation in the Randstad and Rhine-Ruhr. *European Planning Studies*, *24*(11), 2036–2056. https://doi.org/10.1080/09654313.2016.1228832

Gonzalez, W. J. (2015). *New Perspectives on Technology, Values, and Ethics* (Vol. 315). https://doi.org/10.1007/978-3-319-21870-0

Guttman, L. (1954). Some necessary conditions for common-factor analysis. *Psychometrika*, *19*(2), 149–161.

HafenCity Hamburg (n.d.). The HafenCity project. Retrieved July 16 2018 from https://www.hafencity.com/en/overview/the-hafencity-project.html

Hajer, M. (1993). Discourse Coalitions and the Institutionalization of Practice: The Case of Acid Rain in Britain. *Duke University Press,* The Argumentative Turn in Policy Analysis and Planning.

Han, M., de Jong, M., Cui, Z., Xu, L., Lu, H., & Sun, B. (2018). City Branding in China's Northeastern region: How do cities reposition themselves when facing industrial decline and ecological modernization? *Sustainability (Switzerland)*, *10*(1). https://doi.org/10.3390/su10010102

Hollands, R. G. (2008). Will the real Smart City please stand up? Intelligent, progressive or entrepreneurial? In *City* (Vol. 12, pp. 303–320). https://doi.org/10.1080/13604810802479126

iBestuur. (2015). Value case als methodiek voor Smart Cities. Retrieved April 30, 2018, from https://ibestuur.nl/partner-kpn/value-case-als-methodiek-voor-smart-cities

Ibrahim, M. A., & Morsy, D. M. (2016). Smart Cities and Sustainability : A Set of Vertical Solutions for Managing Resources. *International Journal of Environment and Sustainability*, *5*(3), 1–15. https://doi.org/10.24102/ijes.v5i3.706

Jeliazkova, M. I. (2015). *Citizenship Education: SOCIAL SCIENCE TEACHERS' VIEWS IN THREE EUROPEAN COUNTRIES*.

Johnson, G., Scholes, K., & Whittington, R. (2008). *Exploring Corporate Strategy 8th edition*. *Financial Times Prentice Hall*. https://doi.org/10.1016/0142-694X(85)90029-8

Johnston, E. W., & Hansen, D. L. (2011). Design lessons for smart governance infrastructures. In D. Ink, A. Balutis, & T. Buss (Eds.), *American Governance 3.0: Rebooting the Public Square?* National Academy of Public Administration.

Kaiser, H. F. (1960). The application of electronic computers to factor analysis. *Educational and Psychological Measurement*, *20*(1), 141–151.

Kelly, S. L., & Young, B. W. (2017). Examining Undergraduates' Library Priorities Through Q Methodology. *Journal of Academic Librarianship*, *43*(3), 170–177. https://doi.org/10.1016/j.acalib.2017.04.002

Kumar, H., Singh, M. K., Gupta, M. P., & Madaan, J. (2018). Moving towards smart cities : Solutions that lead to the Smart City Transformation Framework. *Technological Forecasting & Social Change*, (April), 1–16. https://doi.org/10.1016/j.techfore.2018.04.024

Lammerse, V. (2016). Smart City: hoort ook Amsterdam bij de steden van de toekomst? Retrieved May 1, 2018, from https://www.scientias.nl/smart-city-hoort-ook-amsterdam-bij-de-steden-van-de-toekomst/

Li, Y., Zhan, C., de Jong, M., & Lukszo, Z. (2016). Business innovation and government regulation for the promotion of electric vehicle use: lessons from Shenzhen, China. Journal of Cleaner Production, 134, 371-383.

Liu, Y. (2016). The study on Smart City construction assessment based on TOPSIS - "The PRD city clusters" as the case. In *International Conference on Smart City and Systems Engineering* (pp. 321–325). https://doi.org/10.1109/ICSCSE.2016.114

Lombardi, P., & Vanolo, A. (2015). Smart City as a Mobile Technology: Critical Perspectives on Urban Development Policies. In M. P. Rodríguez-Bolívar (Ed.), *Transforming City Governments for Successful Smart Cities* (pp. 147–161). Springer International Publishing Switzerland.

Macke, J., Casagrande, R. M., Sarate, J. A. R., & Silva, K. A. (2018). Smart City and quality of life: Citizens' perception in a Brazilian case study. *Journal of Cleaner Production*, *182*, 717–726. https://doi.org/10.1016/j.jclepro.2018.02.078

Mendelow, A. (1991). Stakeholder Mapping. In *Proceedings of the 2nd International Conference on Information Systems*. Cambrigde, MA.

Mendonça, M., Moreira, B., Coelho, J., Cacho, N., Lopes, F., Cavalcante, E., … Moura, B. (2016). Improving public safety at fingertips: A Smart City experience. In *IEEE 2nd International Smart Cities Conference: Improving the Citizens Quality of Life, ISC2 2016 - Proceedings*. https://doi.org/10.1109/ISC2.2016.07580772

Meynhardt, T. (2009). Public value inside: What is Public value creation? *International Journal of Public Administration*, *32*(3–4), 192–219. https://doi.org/10.1080/01900690902732632

Mohammed, F., Idries, A., Mohamed, N., Al-Jaroodi, J., & Jawhar, I. (2014). UAVs for smart cities: Opportunities and challenges. In *2014 International Conference on Unmanned Aircraft Systems, ICUAS 2014 - Conference Proceedings* (pp. 267–273). https://doi.org/10.1109/ICUAS.2014.6842265

Molina, A., Fernández, A. C., Gómez, M., & Aranda, E. (2017). Differences in the City Branding of European capitals based on online vs. offline sources of information. *Tourism Management*, *58*, 28–39. https://doi.org/10.1016/j.tourman.2016.10.005

Moore, M. H. (1995). *Creating Public value: Strategic management in government*. Harvard university press.

Mora, L., & Bolici, R. (2017). How to Become a Smart City: Learning from Amsterdam. In A. Bisello, D. Vettorato, R. Stephens, & P. Elisei (Eds.), *Smart and Sustainable Planning for Cities and Regions: Results of SSPCR 2015* (pp. 251–266). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-319-44899-2_15

Mu, R., de Jong, M., Ma, Y., & Xi, B. (2015). Trading off Public values in High-Speed Rail development in China. *Journal of Transport Geography*, *43*(July 2011), 66–77. https://doi.org/10.1016/j.jtrangeo.2015.01.010

Nam, T., & Pardo, T. A. (2011). Conceptualizing Smart City with dimensions of technology, people, and institutions. *Proceedings of the 12th Annual International Digital Government Research Conference on Digital Government Innovation in Challenging Times - Dg.o '11*. https://doi.org/10.1145/2037556.2037602

Papi, L., Bigoni, M., Bracci, E., & Deidda Gagliardo, E. (2018). Measuring Public value: a conceptual and applied contribution to the debate. *Public Money and Management*. https://doi.org/10.1080/09540962.2018.1439154

Raven, R., Sengers, F., Spaeth, P., Xie, L., Cheshmehzangi, A., & de Jong, M. (2017). Urban experimentation and institutional arrangements. *European Planning Studies*, *0*(0), 1–24. https://doi.org/10.1080/09654313.2017.1393047

Reddick, C. (2011). *Public administration and information technology* (Vol. 1). https://doi.org/10.1007/978-1-4614-9563-5

Rodríguez-Bolívar, M. P. (2015). Transforming City Governments for Successful Smart Cities. In M. P. Rodríguez-Bolívar (Ed.), *Transforming City Governments for Successful Smart Cities* (pp. 1–7). Springer International Publishing Switzerland 2015.

Schmolck, P. (2002). PQMethod (version 2.35). Retrieved April 18, 2018, from http://wp13179300.server-he.de/qmethod/downpqmac.htm

Schuler, D. (2016). Smart Cities + Smart Citizens = Civic Intelligence? In G. Concilio & F. Rizzo (Eds.), *Human Smart Cities: Rethinking the Interplay between Design and Planning* (pp. 41–60). Springer International Publishing Switzerland.

Sengers, F. (2016). *Smart-Eco Cities in The Netherlands: Trends And City Profiles 2016*. Exeter: University of Exeter (SMART-ECO Project).

Shi, H., Tsai, S. B., Lin, X., & Zhang, T. (2017). How to evaluate smart cities' construction? A comparison of Chinese Smart City evaluation methods based on PSF. *Sustainability (Switzerland)*, *10*(1). https://doi.org/10.3390/su10010037

Siddo, S., Moula, N., Hamadou, I., Issa, M., Issa, S., Hamani, M., … Antoine-Moussiaux, N. (2018). Q method to map the diversity of stakeholder viewpoints along agricultural innovation systems: A case study on cattle genetic improvement in Niger. *Archives Animal Breeding*, *61*(1), 143–151. https://doi.org/10.5194/aab-61-143-2018

Smith, R. (2004). Focusing on Public value: Something new and something old. *Australian Journal of Public Administration*, *63*(4), 68–79. https://doi.org/10.1111/j.1467-8500.2004.00403.x

Spano, A. (2009). Public value creation and management control systems. *International Journal of Public Administration*, *32*(3–4), 328–348. https://doi.org/10.1080/01900690902732848

Staal, P. (2017). Innoveren met een community: zo doet Amsterdam Smart City dat [case].

Talbot, C. (2008). Measuring Public value A competing values approach. *The Work Foundation*, (January 2008). https://doi.org/10.1080/10645570903203448

Talbot, C. (2011). Paradoxes and prospects of "Public value." *Public Money and Management*, *31*(1), 27–34. https://doi.org/10.1080/09540962.2011.545544

Tokoro, N. T. A.-T. T.-. (2016). The Smart City and the co-creation of value : a source of new competitiveness in a low-carbon society. Tokyo : Springer,. Retrieved from http://ebookcentral.proquest.com/lib/illcencol-ebooks/detail.action?docID=4092417

Tsirogianni, S., & Gaskell, G. (2011). The role of plurality and context in social values. *Journal for the Theory of Social Behaviour*, *41*(4), 441–465. https://doi.org/10.1111/j.1468-5914.2011.00470.x

van Dijk, A., Teuben, H., Duits, B., Hartveld, S., Ogura, A., Scharrenberg, A., & Tan, C. (2015). *Smart Cities: How rapid advances in technology are reshaping our economy and society*. Deloitte. https://doi.org/10.1016/B978-0-12-407684-6.00014-0

Washburn, D., & Sindhu, U. (2010). *Helping CIOs Understand "Smart City" Initiatives*. *Growth*. Retrieved from http://c3328005.r5.cf0.rackcdn.com/73efa931-0fac-4e28-ae77-8e58ebf74aa6.pdf

Watts, S., & Stenner, P. (2012). *Doing Q Methodological research: Theory, method and interpretation*. London: Sage.

Winden, W. van, Oskam, I., Buuse, D. van den, Schrama, W., Dijck, E.-J. van, & Frederiks, M. (2016). *ORGANISING SMART CITY PROJECTS: Lessons from Amsterdam*.

Yanrong, K., Lei, Z., Cai, C., Yuming, G., Hao, L., Ying, C., … Hart, T. (2016). *Comparative Study of Smart Cities in Europe and China 2014*. (Q. Hai, Ed.). The Commercial Press China and Springer-Verlag Berlin Heidelberg 2016. https://doi.org/10.1007/978-3-662-46867-8

Yigitcanlar, T., Kamruzzaman, M., Buys, L., Ioppolo, G., Sabatini-Marques, J., Moreira da Costa, E., & Joseph Yun, J. (2018). Understanding "smart cities": Intertwining development drivers with desired outcomes in a multidimensional framework. *Cities*, (April). https://doi.org/10.1016/j.cities.2018.04.003

Zhou, Q., & Mayer, I. S. (2018). Models, simulations and games for water management: A comparative Q-method study in The Netherlands and China. *Water (Switzerland)*, *10*(10). https://doi.org/10.3390/w10010010

10. Web references

These references are used in the actor description and actor problem formulation in chapter 5 Actor Analysis of Smart City development.

[1] Https://www.alliander.com/en/about-alliander
[2] Http://www.amsterdamarena.nl/international-activities.htm
[3] Https://www.amsterdameconomicboard.com/en/who-are-we
[4] Https://amsterdamsmartcity.com/network/amsterdam-smart-city#about
[5] Https://www.arcadis.com/en/united-kingdom/
[6] http://www.citizendatalab.org
[7] https://amsterdamsmartcity.com/network/chief-technology-office
[8] Http://www.amsterdamuas.com/about-auas/organisation/organisation.html
[9] Https://overons.kpn/en/the-company/our-mission
[10] Https://dezwijger.nl/over-ons/about-us/
[11] Https://www.postnl.nl/en/about-postnl/about-us/our-strategy/
[12] https://www.tno.nl/en/about-tno/
[13] Http://waag.org/en/about-us

[14] Https://newsroom.cisco.com/overview
[15] https://www.hcu-hamburg.de/en/research/citysciencelab/
[16] https://www.hafencity.com/upload/files/artikel/HafenCityProjekte_March_2017_english.pdf
[17] https://www.hcu-hamburg.de/en/university/
[18] Https://de.wikipedia.org/wiki/Hamburg_Energie
[19] Https://hhla.de/en/group.html
[20] Https://www.hamburg-port-authority.de/en/
[21] https://www.haw-hamburg.de/english/about-us.html
[22] https://www.uni-hamburg.de/en/uhh/profil.html
[23] Https://mlove.com
[24] Https://corporate.vattenfall.com/about-vattenfall/vattenfall-in-brief/

11. Appendices

Appendix I. Smart City development stages by Van Dijk *et al.* (2015)

Table 11.1 Smart City development stages by Van Dijk et al. (2015)

	Initial	***Intentional***	***Integral***	***Transformed***
Strategy & Vision	Unconnected fragments of a Smart City vision are found in some departments.	Cross-departmental vision and strategy emerges with key stakeholders aligned around it.	Integral citywide vision and strategy based on a thorough assessment of strengths, opportunities and challenges of the city.	Vision and strategy are subject to continuous optimization in an agile environment, based on measurement/data of realized benefits
	Strategy fragments have an operational focus, such as increasing efficiency.	Strategy focus shifted from internal efficiency to user-centricity. User demands are driving the digital transformation.	User-centric strategy becomes increasingly focused on transforming business models.	Successful realization of the user-centric strategy to transform business models.
	Strategy development is an internal activity of city government.	Increasing awareness of the need to involve users in strategy development.	Users and stakeholders are consulted to provide input for strategy development.	Users and stakeholders are actively involved in strategy development through co-creation.
	No clear image of what the city wants to be in the long term. Highly driven by technology push. Act as living laboratory.	Fragmented image of what the city wants to become. Counterweight to technology push is growing but not yet mature.	Clear vision on the cities long term future. City priorities are driving the investment portfolio.	Strategic investments have clear impact realizing the long term vision.
	Consequences of innovations like Airbnb or Uber overtake city government.	Partial response of the city to innovations like Airbnb and Uber.	Balanced and effective response of the city to innovations like Airbnb and Uber.	City is able to act pro-active, fast and effective to innovations that impact the city.
Projects & Solutions	Ad hoc, department based projects driven by technology push and random initiatives.	Cross-departmental projects emerge but still in an opportunistic way.	A cohesive citywide portfolio of cross- departmental projects delivers recurring success.	Initiatives are characterized by agility and focused on innovation.
	In general, experimental by nature.	First projects go beyond the pilot phase and scale up to city wide use.	City wide foundational technology, processes and standards emerge.	Continuous improvement of service delivery brings competitive advantage.
	Mainly small scale pilot projects and proof of concepts to prove the business case for further investment.	First attempts to execute innovation projects in an agile way.	Benefits tracking is in place.	Superior outcomes that deliver differentiation.
	Project execution and monitoring is subject to classic project-bureaucracy.			

	Initial	*Intentional*	*Integral*	*Transformed*
Data	Data is collected in the context of traditional city processes / responsibilities only.	Small scale pilots to collect (IoT) data specific for smart solutions are in place.	First city wide collection of (IoT) data specific for smart solutions is operational	Data fueling the full spectrum of smart solutions is collected.
	Data is used for the delivery of a particular service and not re-used for other purposes.	Small scale re-use of data to fuel smart solutions and data analytics.	Data is combined from multiple sources in new creative ways.	Data from various sources is used to create a complete visual overlay of the city.
	Basic analysis of data in the form or simple reporting on isolated data sets.	Pilots with advanced data analytics on city data emerge.	Data analytics is applied on combined data sets to provide new insights	City wide use of mature advanced data analytics (real-time, big data, predictive).
	Data is stored in disparate systems and is difficult to access and combine.	Technical solutions (data platform) to combine and re-use data emerge.	Government services and external partners use the data platform for their open data	All data is available through a single "data hub" and via open standards.
	Some data sets are opened to the public, but only historic data (no real-time data).	Pilots with providing real-time (IoT) data are being set up.	First city wide examples of real-time (IoT) data are operational	Open data encompasses full real-time (IoT) data to be used by smart solutions.
	Data quality of open data is not guaranteed, no mature data management processes.	Initiatives to define data management standards and processes are in place	Data management standards and processes are being implemented.	Operational data management standards and processes, data quality is guaranteed.
	Policies for data sharing, privacy, anonymization, authorization, charging & monetization etc. are not in place.	Partners (city and external parties) have identified the need for such policies and initiatives are in place to define them.	Partners have agreed a first version of data policies and start using them in practice.	Data by parties in the ecosystem use is governed by agreed data policies.
Technology	Fixed and mobile internet broadband networks are in place.	Shared architectures are deployed on a limited set of services.	City wide implementation of an IoT platform unifying management of all kinds of sensors.	Cross organizational technology architectures are in place.
	Technology architecture is characterized by point solutions for line of business applications.	Stakeholders are intentionally investing in sensoring technologies.	Joint investments plans for city wide deployment of connected assets with multi purpose sensors.	Continuous learning and improvement of the joint architecture to support innovation and transformation.
	Limited investments in sensors and M2M networks.	Dedicated M2M / IoT networks (low bandwidth, high range) are in place.	Standards and policies are in place to create integral architectures.	City wide deployment of connectivity infrastructure and sensors networks for all major smart solutions.
Competences	No clear view on the skills and competences that are needed to execute the digital strategy successfully.	Required skills and competences are pinpointed and a plan is in place for developing the workforce capabilities.	Skills and competences of the workforce are developing but deficiencies still exist at some pockets of expertise.	City government uses a blend of investment, innovative approaches and external support to secure the right skills and competences.

	Initial	*Intentional*	*Integral*	*Transformed*
	Smart City initiatives are executed with existing skills and competences.	Efforts mainly directed at equipping existing workforce with new awareness.	Efforts are made to develop genuinely new skills: research and analysis, technology skills, agile project management, user experience skills, financial modelling for digital business models and commercial skills.	The next generation of talent is attracted by a workforce strategy that highlights and communicates the impact of the work on the lives of citizens, and by offering employees the flexibility to work creatively.
Openness	Low appetite for taking risks and experiment. Mechanisms for employee appraisal favor a risk-averse way of working.	Growing awareness for the need to become open for new ideas, experimenting and taking calculated risks.	City wide transition towards an altered attitude to risk and willingness to experiment with new ideas.	The "fail fast, fail quickly and fail cheap" approach has become part of the organization's DNA.
	Government tends to focus on securing internal buy-in rather than on delivering customer needs.	Government is actively looking for new ideas through competitions, hackathons, etc.	New ways of collaboration between departments and with external parties emerge.	Ability to learn fast and to adopt new ideas quickly.
Ecosystem	Siloed internal organization with respect to smart cities.	Internal and external collaboration is growing.	Government is becoming part of creative public- private ecosystems in which neither of the participants has top-down control.	The new way of working in creative ecosystems has transformed the government organization itself.
	Private parties purely in the role of technology vendor.	Government is still organized in the traditional way, but becomes conscious of its assets (e.g. data) and open for new ways of working together with external parties.	Parties in these ecosystems are working together to create a result that has value for them all.	Government is successfully acting according to its new roles
	Attempt to match technology push with existing city policies.			

Appendix II. Core assumptions and model of Public value Mapping

Table 11.2 Core assumptions of Public value Mapping by Bozeman & Sarewitz (2011)

1.	PVM is either prospective (analyzing planned or projected research activities), ''formative'' (analyzing such activities as they are occurring), or ''summative'' (evaluating activities and their impacts after they have occurred).
2.	It seeks to take into account the highest order impacts of activities (i.e. broad social aggregates) and, thus, focuses on social indices and social indicators.
3.	It is multi-level in its analysis, seeking to show linkages among particular program activities of an agency or institution, activities of other agencies or institutions, relationships- either intended or not- among various institutional actors and their activities.
4.	PVM is concerned with understanding the environmental context for research and related programmatic activities, locating the activities and their institutional actors in terms of other actors in the environment, the constraints, opportunities and resources presented in the environment.
5.	Research in any field by any method is embedded in a social context; in PVM analysis of the social context of the research (i.e. characteristics of research performers, their attributes and social relations) is a part of the analysis.
6.	PVM is guided by a ''Public value model of science outcomes'' rather than a market-based or market failure model. PVM explicitly rejects evaluation and assessment based on commodification of research values and outcomes. Market prices are viewed as weak partial indicators of the social value of research and research outcomes. Even as a partial indicator, market value is considered in terms of not only magnitude but also distribution and equity criteria.
7.	Since market value is eschewed in PVM and since social values are not interpersonally transmissible, PVM anchors its outcomes values in a wide range of criteria derived from diverse sources including: [1] official, legitimated statements of policy goals; [2] goals implicit in poorly articulated policy statements; [3] government agencies' goal statements in strategic plans; [4] aggregated statements of value represented in opinion polls; [5] official policy statements by government actors; [6] official policy statements by relevant NGOs.
8.	PVM analyzes (maps) the causal logic relating goals statements (any of the above) to science and research activities, impacts and outcomes, both measured and hypothesized. When possible, this analysis begins with the causal logic articulated by responsible officials. The causal logics, explicit or implicit, that are the basis of science and research activities are then considered in relation to various plausible alternative hypotheses and alternative causal logics invented by the analyst.
9.	PVM is not an analytical technique or even a set of analytical techniques, but a model that includes a guiding theoretical framework (Public value theory), a set of assumptions and procedures. Research techniques employed in PVM depend upon the needs and possibilities afforded by the context of its application. The only technical approach used in all applications of PVM is the case study method.
10.	After gathering data to test hypotheses about causal logics and outcomes, appropriate analysis (selected depending upon specific analytical techniques used), is employed to test hypotheses and, at the same time, measure impacts and outcomes. Results of analysis focus on interrelationships among the causal logic, the environmental context and measured impacts and outcomes.
11.	PVM concludes with a linkage of impact and outcome measures back to aggregate social indicators or other appropriately broad-based, trans-institutional, trans-research program measures of social well-being.
12.	PVM concludes with analysis and recommendations focusing on possible changes (in research or program activity, causal logic, implementation) that seem likely to lead to improved social outcomes.

Table 11.3 Public failure and public policy: a general diagnostic model (Bozeman & Sarewitz, 2011, p.17)

Public Failure Criterion	Failure Definition	Science Policy Example
Mechanisms for Values Articulation and Aggregation	Political processes and social cohesion insufficient to ensure effective communication and processing of Public values.	Peer review, the favoured means of making decisions of individual-level projects, is appropriated for decisions about huge scientific programs, resulting in the displacement of social goals for more easily resolved technical goals.
Imperfect Monopolies	Private provision of goods and services permitted even though Government monopoly deemed in the public interest.	When public authorities abrogate their responsibility for overseeing public safety in clinical trials for medical research, there is potential for violation of public trust and Public value.
Scarcity of Providers	Despite the recognition of a Public value and agreement on the public provision of goods and services, they are not provided because of the unavailability of providers.	The premature privatization of the Landsat program shows that a scarcity of providers can create a public failure potentially remediable by government action.
Short Time Horizon	A short-term time horizon is employed when a longer-term view shows that a set of actions is counter to Public value.	Policy for energy R&D, by considering the short term, fails to fully capture the costs of global climate change on future generations.
Substitutability Vs. Conservation of Resources	Policies focus on either substitutability or indemnification even in cases when there is no satisfactory substitute.	No-net-loss' policies fail to take into account the non-substitutability of many natural organisms ranging from wetlands protection to prohibiting the sale of human organs on the open market.
Benefit Hoarding	Public commodities and services have been captured by individuals or groups, limiting distribution to the population.	A prime technical success of genetic engineering, the 'terminator gene,' proves an excellent means of enhancing the efficiency of agricultural markets, potentially to the detriment of millions of subsistence farmers throughout the world.

Appendix III. Full list of statements

Table 11.4 Full list of statements

#	Type	Source	Original	Statement	Value	Q-set
1	Article	Braun, et al., 2018, p.507	Ultimately, solutions to Smart City challenges will be most effective when they utilize a holistic approach to security and privacy. The Smart City is comprised of a plethora of interconnected devices, so security and privacy solutions need to centre around a system of defence rather than simply a sum of individual defences. Therefore, layered security approaches and transparent standards for privacy will be crucial to the construction of smart cities.	The large number of interconnected devices in the Smart City require a central system of defence. Layered security approaches and transparent standards for privacy are crucial to the construction of smart cities.	M-Secrecy	Yes
2	Article	Kumar, et al., 2018, p.10	The findings suggest proper planning and integration of infrastructure (city physical infrastructure, IoT devices, sensors, network platform and data analytics) improve the service delivery and efficiency.	Proper planning and integration of infrastructure improves the service delivery and efficiency of the Smart City.	H-Service Quality	No
3	Article	Kumar, et al., 2018, p.10	Development of technology solutions and adaptive use of technology are required for smart cities that can react quickly to the changing citizens' needs and demands.	Constant development of technology solutions and adaptive use of technology are required when a Smart City wants to react quickly to the changing citizens' needs and demands.	H-Service Quality	No
4	Article	Kumar, et al., 2018, p.10	To get the user value, the Smart City governance should work closely with citizens and different stakeholders to identify the set of services, prioritizing the needs, quickly deliver, lower costs services for a long-term city transformations that can accelerate Smart City development.	The Smart City governance should work closely with citizens, because this will accelerate Smart City development.	P-Social innovation	Yes
5	Article	Macke, et al., 2018, p.724	From a Smart City perspective, the research concludes that success within the domain of smart living can be achieved by providing the four factors revealed by the analysis: (i) socio- structural relations; (ii) environmental well-being; (iii) material well-being; and (iv) community integration.	From a Smart City perspective, success within the domain of smart living can be achieved by providing environmental well-being and material well-being.	U-Sustainability	Yes
6	Article	Mora & Bolici, 2017, p.254	the essence of the Amsterdam approach is that Living Labs are being used for the projects [...]. Involving [...] citizens is essential [...] since the tested technologies are useless without [their] acceptance and experience	New technologies are useless without acceptance and experience of the citizens	P-Citizen involvement	No

#	Type	Source	Original	Statement	Value	Q-set
7	Article	Ahvenniemi, et al., 2017, p.242	In our opinion, the role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself. Ultimately, a city that is not sustainable is not really "smart".	The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.	U-Sustainability	Yes
8	Article	Yigitcanlar, et al., 2018, p.4	Smart cities face the risk of social exclusion and gentrification.	Smart cities face the risk of social exclusion.	P-Equal opportunities	No
9	Book	Bisello, et al., 2015, p.257	Collective effort: a highly collaborative approach is considered fundamental for achieving results. For this reason, cooperation between the public and private sectors is constantly stimulated and supported in every project, together with the involvement of citizens	A highly collaborative approach between public and private sector is fundamental for achieving results.	P-Compromise	No
10	Book	Bisello, et al., 2015, p.257	Economic viability: only the most advantageous projects can be considered for potential large-scale implementation;	In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation	H-Reliability	Yes
11	Book	Bisello, et al., 2015, p.257	Knowledge dissemination: sharing and spreading the knowledge acquired during the path towards the Smart City transformation are considered as actions of crucial importance	Sharing and spreading the knowledge acquired during the path towards the Smart City transformation are actions of crucial importance.	P-Social innovation	Yes
12	Book	Yanrong, et al., 2016, p.10	The vision of how a Smart City should be built and run is moving away from the traditional 'closed and top-down' approach to a more 'open model'.	The vision of how a Smart City should be built and run is moving away from the traditional 'closed and top-down' approach to a more 'open model'.	M-Secrecy	No
13	Book	Yanrong, et al., 2016, p.201	Many of the pilot smart cities engage with citizens via mobile applications (apps) that require access to smart devices. As a result, there is a risk that the needs of low-income individuals, less-educated groups, the elderly and others in need that do not have smart devices and/or do not know how to use them will be excluded.	Because of the use of mobile applications to engage with citizens, there is a risk that the needs of low-income individuals, less-educated groups, the elderly, and others in need, that do not have smart devices and/or do not know how to use them, will be excluded.	P-Equal opportunities	Yes
14	Book	Yanrong, et al., 2016, p.221	Making it easier for private sector involvement: Government policy can also be used to create a favourable environment for private sector involvement.	Government policy should be used to create a favourable environment for private sector involvement, to stimulate development.	P-Compromise	No

#	Type	Source	Original	Statement	Value	Q-set
15	Book	Sengers, 2016, p.3	all the interviewees were in agreement about the difficulty of gaining a comprehensive and up-to-date overview of the ambitions and especially experiments conducted in Dutch cities, because the pace of these developments is so fast	It is difficult to have an up-to-date overview of the Smart City implementations, because of the pace of development	U-Openness	No
16	Book	Anthopoulos, 2017, p.187	according to the identified challenges that the Smart City deals with: city's adaptation to climate change improves urban behaviour against extreme environmental phenomena and in this respect, enhances residents' safety feelings.	A Smart City's adaptation to climate change improves urban behaviour against extreme environmental phenomena and in this respect, enhances residents' safety feelings.	U-Robustness	No
17	Book	Anthopoulos, 2017, p.188	citizen engagement in policy making increase their beliefs in government's accountability and transparency.	Citizen engagement in policy making will increase their beliefs in government's accountability and transparency. Therefore, governments should apply this.	P-Citizen involvement	No
18	Book section	Schuler, 2016, p.57	Transparency of information is a good antidote to possible excesses of government and business, including the future deployment of Smart City ideas and systems.	Transparency of information is a good antidote to possible excesses of government and business, including the future deployment of Smart City ideas and systems.	M-Secrecy	No
19	Book section	Schuler, 2016, p.58	the ability to launch new communities/networks that are transdisciplinary will be crucial if civil society is to successfully organize itself to promote civic intelligence, to engage with the problems we face, and to mount successful challenges to the powers that will be.	The ability to launch new communities/networks that are transdisciplinary will be crucial if civil society is to successfully organize itself to promote civic intelligence.	U-Self-initiative	No
20	Book section	Schuler, 2016, p.59	We need smart cities. But without a vigorous, aware, ubiquitous, and diverse contingent of smart citizens, we will not develop the civic intelligence that is desperately needed.	A Smart City needs a vigorous, aware, ubiquitous, and diverse contingent of smart citizens, in order to create the civic intelligence that is desperately needed.	M-Diversity	No
21	Book section	de Oliveira, 2016, p.197	'technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.	'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.	P-Citizen involvement	Yes
22	Book section	Johnston & Hansen, 2011, p.22	Investing in smart governance infrastructures identified in this chapter returns power back to the people, but not freely, because greater participation comes with higher expectations, accountability, and responsibility. The evolution of governance is inevitable	In a Smart City, a greater participation of the citizens is required. This comes with higher expectations, accountability, and responsibility.	P-Social innovation	No

#	Type	Source	Original	Statement	Value	Q-set
23	Book section	Rodríguez-Bolívar, 2015, p.3	smart cities have really become in relational networks of actors [..] and the interaction among these urban actors constitute urban governance. Hence, governance is not about what governments do but about the outcomes of interactions between all actors in the public domain.	Governance is not about what governments do, but about the outcomes of interactions between all actors in the public domain.	M-Diversity	No
24	Book section	Anttiroiko, 2015, p.38	Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.	Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.	H-Cultural heritage	Yes
25	Book section	Anttiroiko, 2015, p.38	Smart City is not originally designed as the framework for local economic development policy, but it has a potential to serve such a function. It can serve both in defining means and ends of local economic development, which refer respectively to such major aspects as smart facilitation mechanisms and smart policy choices in local economic restructuring.	Smart City is not originally designed as the framework for local economic development policy, but It can serve both in defining means and ends of local economic development (such as smart facilitation mechanisms and smart policy choices in local economic restructuring).	U-Sustainability	No
26	Book section	David, et al., 2015, p.69	Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.	Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.	U-Openness	Yes
27	Book section	Lombardi & Vanolo, 2015, p.158	in the current scenario characterised by economic crisis and unsustainable life styles, the Smart City policy represents an attempt to attract and co-opt private actors in the provision of urban services.	In a scenario characterised by economic crisis and unsustainable life styles, the Smart City policy represents an attempt to attract private actors in the provision of urban services.	M-Integrity	No
28	Conference contribution	Chourabi, et al., 2012, p.2293	smart cities initiatives allow members of the city to participate in the governance and management of the city and become active users.	Smart cities initiatives allow members of the city to participate in the governance and management of the city and become active users.	P-Citizen involvement	No
29	Conference contribution	Liu, 2016, p.325	Smart security is supported. Intelligent security plays an important role in support in Smart City construction.	Intelligent security plays an important role in supporting Smart City construction.	U-Robustness	No

#	Type	Source	Original	Statement	Value	Q-set
30	Conference contribution	Liu, 2016, p.325	The Smart City's nature is the innovation of the urban development phase, its continuous development of power is technology and innovation. So, in the process of Smart City construction, science and technology and innovation should be attach importance and become the inexhaustible driving force of smart urban development.	The Smart City's nature is the innovation of the urban development phase.	P-Social innovation	No
31	Conference contribution	Liu, 2016, p.325	The wisdom of the people's livelihood is the goal. The development of Smart City, not only to solve the urban problems of energy and environment, also to improve and change the urban residents' way of life. Therefore, in the process of intelligent city construction, smart livelihood should be always attached importance and make the residents to enjoy the advantages of the city wisdom.	In the process of Smart City construction, smart livelihood should always be made important. This will make the citizens enjoy the advantages of the city wisdom.	H-Service Quality	No
32	Conference contribution	Nam & Pardo, 2011, p.285	Creativity is recognized as a key driver to Smart City, and thus people, education, learning and knowledge have central importance to Smart City.	Creativity is recognized as a key driver to Smart City, and thus people, education, learning and knowledge have central importance to Smart City.	P-Social innovation	Yes
33	Conference contribution	Nam & Pardo, 2011, p.285	A Smart City is a humane city that has multiple opportunities to exploit its human potential and lead a creative life.	A Smart City is a humane city that has multiple opportunities to exploit its human potential and lead a creative life.	M-Human dignity	No
34	Conference contribution	Nam & Pardo, 2011, p.287	A Smart City initiative becomes an integrated approach to connecting among entire communities (governments, businesses, schools, non-profits, and individual citizens), creating specific services to address city objectives, and advancing collective skills and capacities.	A Smart City initiative becomes an integrated approach to connecting among entire communities, creating specific services to address city objectives, and advancing collective skills and capacities.	H-Service Quality	No
35	Conference contribution	Hollands, 2008, p.315	First and foremost, 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.	Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.	M-Human dignity	Yes
36	Journal article	Ibrahim & Morsy, 2016, p.14	The government has to make the data open for the public and make it easy for the public to make and contribute their own data. The Smart City vision can’t be achieved without the participation of the public and their contribution with the government in making	The Smart City vision can’t be achieved without the participation of the public and their contribution with the government in making decisions.	P-Citizen involvement	Yes

#	Type	Source		Original	Statement	Value	Q-set
				decisions.			
37	Master Thesis	Capra, 2014, (Interview Alliander)	p.91 with	I think it makes sense that when you start a project like this, you don't directly start from within the municipality, so it makes sense to have an innovation platform, or Smart City initiative, in which you try to develop all kind of projects for the city, together with the city, but is not a city driven program, so that's a good distinction.	A Smart City initiative should come from a private innovation platform, not as a city driven program.	P-Compromise	Yes
38	Master Thesis	Capra, 2014, (Interview Alliander)	p.91 with	Two things are very important [if you look at smart cities], that's connectivity, and to have connectivity you always have to have a very good grid, and to be able to have different kinds of solutions like electrical vehicles charging or whatsoever, been put into the grid.	Connectivity should be the main goal of the Smart City	M-Diversity	No
39	Master Thesis	Capra, 2014, (Interview Alliander)	p.91 with	[..] you see that the infrastructure firms can have more an enabling position, if you look at smart cities. Two things are very important, that's connectivity, and to have connectivity you always have to have a very good grid, and to be able to have different kinds of solutions like electrical vehicles charging or whatsoever, been put into the grid.	Most Smart City solutions rely on a good electrical grid, what creates an enabling position for infrastructure firms	H-Service Quality	No
40	Master Thesis	Capra, 2014, (Interview Alliander)	p.91 with	we have few projects in which we let the community depend what types of projects and what the subject of the different projects will be. Which will actually add to their neighbourhood. So that's social innovation.	Letting the community decide which topics will be addressed, will increase project efficiency	P-Social innovation	No
41	Master Thesis	Capra, 2014, (Interview Alliander)	p.92 with	It also helps if you know all the local stakeholders and it's easier to lead projects there.	Local stakeholders are essential for project success in that specific region.	P-Compromise	No
42	Master Thesis	Capra, 2014, (Interview Alliander)	p.92 with	But then it's a contract between municipality and Alliander or whatsoever, and then the whole group. There is a high level, and I think it's necessary, of intrinsic motivation and trust, which has to be part of a collaboration like this. I think that is an important part of working closely together on societal challenges as well.	Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.	M-Integrity	Yes
43	Master Thesis	Capra, 2014, (Interview Alliander)	p.93 with	Smart City is about working together, about cooperation, about collectively working towards a common goal, and all with their own goals attached as well.	Smart Cities are about working together, about cooperation, about collectively working towards a common goal.	M-Integrity	Yes

#	Type	Source	Original	Statement	Value	Q-set
44	Master Thesis	Capra, 2014, p.89 (Interview with Amsterdam Economic Board)	On city level, there are Co2 reduction goals, and that's quite a clear goal we want to contribute to, but there are also other goals that you might see in a Smart City, to be more inclusive, to have tourists visit our city in a way they work nicely together with the people living here, that's especially in city centre is a big issue. But also traffic jams and things like that. I don't think goals are really defined, but if we wouldn't contribute to these kind of goals, we would be probably doing something wrong.	A Smart City should not only focus on the specific goals that are set (e.g. CO2 reduction), but should also contribute to other big issues coming to the surface in the city centre.	U-Sustainability	No
45	Master Thesis	Capra, 2014, p.89 (Interview with Amsterdam Economic Board)	Especially on local level, what we do is to try to connect with all these local groups and organizations that are in our districts or in our neighbourhoods […] and we see whether we can connect our network to help them get their projects off the ground.	A Smart City should be used to connect local groups and organizations with a network to get their project off the ground	M-Diversity	No
46	Master Thesis	Capra, 2014, p.90 (Interview with Amsterdam Economic Board)	I think that is the short cycle of projects that helps to find collaborations that really work.	Short cycle projects help to find collaborations that really work	U-Robustness	No
47	Master Thesis	Capra, 2014, p.98 (Interview with Clicks and Links)	We just want people to be smart about the decisions they make, think in smart ways, reduce waste	The goal of the Smart City is to make people 'smart' about the decisions they make (e.g. to reduce waste)	U-Self-initiative	No
48	Master Thesis	Capra, 2014, p.105 (Interview with WAAG Society)	It is also very important that if we get eventually more and better quality data, then the official measurements can be enhanced as well, so it will also lead to better decision-making. I think that's the main purpose, and so far it's very encouraging.	The main purpose of information projects is to get more and better quality data, which can be used to improve decision-making	H-Service Quality	No
49	Master Thesis	Capra, 2014, p.106 (Interview with WAAG Society)	in general I think everybody agrees there are 4 reasons for open data: one is enhancing transparency – this is a political thing; then there is enhancing efficiency [...]	A Smart City should use open data to enhance transparency, which can make decision-making more efficient	U-Openness	No
50	Master Thesis	Capra, 2014, p.106 (Interview with WAAG Society)	Personally, I think it can be done, with the bottom-up methodologies you can provide big results (open source data, where the input comes from the citizens and not from the companies)	A bottom-up methodology (open source data, where the input comes from the citizens and not from the companies) can provide the best results	P-Social innovation	Yes

#	Type	Source	Original	Statement	Value	Q-set
51	Report	Washburn & Sindhu, 2010, p.5	An efficient city administration that provides services to its citizens and fosters businesses is essential to today's service-based economy.	An efficient city administration that provides services to its citizens and fosters businesses is essential to today's service-based economy.	H-Service Quality	No
52	Report	Washburn & Sindhu, 2010, p.6	The heightened use of technology in education will increase access, improve the quality and experience, and reduce costs of the Smart City development.	The Smart City should heighten the use of technology in education, because this will increase access, improve the quality and experience, and reduce costs.	H-Service Quality	No
53	Report	Washburn & Sindhu, 2010, p.7	Reduce traffic congestion while encouraging the use of public transportation. Offering faster and more convenient public transportation alternatives is already on most cities' road maps to reduce congestion and related financial and environmental impacts.	The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.	U-Robustness	Yes
54	Report	Washburn & Sindhu, 2010, p.6-7	Use real-time information to respond rapidly to emergencies and threats. With more people living in the city, police, fire, and other public safety personnel need to respond more quickly to emergency situations as well as stay on top of the overall crime rate. Smart public safety initiatives around the world are experimenting with communication technologies to feed real-time information to fire and police departments.	The Smart City should focus on the use of real-time information to respond rapidly to emergencies and threats, because the larger the population gets, the quicker the emergency response needs to be.	U-Sustainability	Yes
55	Report	Washburn & Sindhu, 2010, p.7	Deliver only as much energy or water as is required while reducing waste. A smart utility infrastructure — for energy and water — entails making existing systems efficient and finding new ways of producing and delivering water, gas, and electricity.	A smart utility infrastructure entails making existing systems efficient and finding new ways of producing and delivering water, gas, and electricity.	H-Service Quality	No
56	Report	Washburn & Sindhu, 2010, p.13	Security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted. Often, information security is not a priority when infrastructure rollouts happen.	Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.	M-Secrecy	Yes
57	Report	Van Winden, et al., (2016), p.106	A partner ecosystem should not be fixed or inward-looking, but rather be open for new partners to enter when the project asks for new/different competencies or when it enters a new stage in its development.	A partner ecosystem should not be fixed or inward-looking, but rather be open for new partners to enter when the project asks for it.	M-Diversity	No

#	Type	Source	Original	Statement	Value	Q-set
58	Report	Van Winden, et al., (2016), p.106	When Smart City projects have multiple partners, it is vital that each partner is explicit and transparent about its intended ambitions, objectives and expectations for participating in the project.	In a multi-partner Smart City projects, it is vital that each partner is explicit and transparent about its intended ambitions, objectives and expectations.	U-Openness	No
59	Report	Van Winden, et al., (2016), p.109	Engagement of (prospective) users and community building is a complex process requiring more time and effort than was usually envisioned at the start of the project.	Engagement of (prospective) users and community building is a complex process requiring more time and effort than was usually envisioned at the start of the project.	P-Citizen involvement	No
60	Report	Van Winden, et al., (2016), p.110	Impact measurement is underexposed in Smart City projects.	Impact measurement is underexposed in Smart City projects.	H-Service Quality	No
61	Report	Van Winden, et al., (2016), p.111	Translating sustainable and social value into continuous revenue streams is difficult, but important to increase the possibility of successful upscaling.	Translating sustainable and social value into continuous revenue streams is difficult, but important to increase the possibility of successful upscaling.	U-Sustainability	No
62	Report	Van Winden, et al., (2016), p.112	Many Smart City solutions fail because they overlook (or underestimate) the reluctance of people and organisations to change their behaviour and routines: the human-technology interaction.	Many Smart City solutions fail because they or underestimate the reluctance of people and organisations to change their behaviour and routines: the human-technology interaction.	H-Cultural heritage	No
63	Web article	Angelidou, 2016, p.21	All projects are built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.	All projects should be built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.	U-Sustainability	Yes
64	Web article	Daalhof, 2016	“Het gaat er bij investeringsvraagstukken in de maatschappij niet meer uitsluitend over of en hoeveel euro er bespaard wordt, maar eveneens over de ‘maatschappelijke’ winst die behaald kan worden.”	In the case of investment issues in society, it is no longer solely about whether and how much money is saved, but also about the 'social' profit that can be achieved.	M-Integrity	No

#	Type	Source	Original	Statement	Value	Q-set
65	Web article	Eco, 2017	The digitalization of educational institutions is still in its infancy, with high expenditures expected to be incurred in the coming years for hardware, software, and services such as cloud platforms and digital learning content.	The digitalization of educational institutions is still in its infancy, big steps can be made in the coming years.	H-Service Quality	No
66	Web article	Eco, 2017	The study also forecasts high levels of investment in “Health Infrastructure”. Mobile health devices such as portable blood sugar measurement appliances are driving this development. The aging population will increasingly benefit from digital patient files and personal health management.	"Health Infrastructure" should mainly focus on the aging population, because they can increasingly benefit from digital patient files and personal health management.	H-Service Quality	Yes
67	Web article	Eco, 2018	We can only solve the challenges of urbanization by working closely with all of the players in politics and business	We can only solve the challenges of urbanization by working closely with all of the players in politics and business	P-Compromise	Yes
68	Web article	iBestuur, 2015	In alle openheid trans sectoraal samenwerken vraagt durf van betrokken partijen. [...] Wil een Smart City-initiatief echt succesvol zijn, dan zullen alle partijen gezamenlijk dezelfde doelstelling moeten najagen.	A Smart City can only be successful, when all parties have the same goals	U-Openness	No
69	Web article	Lammerse, 2016	“Als je overal informatie over hebt, zou je die informatie ook kunnen gaan misbruiken. Daar moeten we dus goed over nadenken.”	The large amount of data collected in a Smart City, can also end up in the wrong hands and be misused. This is the biggest counterargument for implementing a Smart City.	M-Secrecy	No
70	Web article	Staal, 2017	Maaike: “Om innovatie te laten slagen, is openheid essentieel. Andere partijen moeten namelijk weten waar je mee bezig bent om ergens bij aan te haken. Gebeurt dat niet, dan zal innovatie zeker niet gebeuren.”	To make innovation succeed, openness in business is essential.	U-Openess	Yes

Appendix IV. Full Actor Analysis

Actor problem formulation Amsterdam

Table 11.5 Actor description and problem formulation Amsterdam

ORGANISATION	INTERESTS	DESIRED SITUATION / OBJECTIVE	EXISTING OR EXPECTED SITUATION AND GAP	CAUSES	POSSIBLE SOLUTIONS
Amsterdam Economic Board	Prosperity and well-being in the Amsterdam Metropolitan Area (AMA).	To connect people and organisations to realise the ambitions, and influence policy agendas in the region.	Too many initiative take too much time at the drawing board, without real action.	Too many organizations involved without clear role division and a common goal	**At the start of every project, set a clear goal and set of values to contribute to.**
Amsterdam Smart City Platform	Effective and efficient Smart City development	A liveable city where people can live and work pleasantly	Creating the overview of the ecosystem, connecting communities to share expertise and kick-starts, and accelerate and strengthen new projects that make the city futureproof.	The initiatives are present, it only lacks continuity for the long term.	**Upscaling of projects with dedicated actors**
Citizen Data Lab (CDL)	Adding new knowledge by conducting specific research	Gaining insight in how to effectively and efficiently empower citizens and protect the data in Smart research.	Citizens do not know the possibilities of the technological developments.	Projects focussed on the technological part of the equation	**Citizen involvement in technological development projects**
City of Amsterdam (Gemeente Amsterdam); CTO	Suitable living environment for all citizens	A Smart City that supports both economic development and citizen well-being	Ineffective Smart City projects	Small scale projects in closed environment	**Setting a clear set of Public values that a project wants to contribute to**
Focus Groups (02025, AVEnergie)	The focus groups want to emphasize the importance of their specific topic to authorities and try to propagate the voice of the citizens.	Convincing the projects initiators that their interest should be considered in the development of new projects.	Topics like energy transition and sustainability are not a priority for Smart City development projects.	Projects are too much focussed on economic benefits	**More regulations to stimulate companies to meet specific goals in sustainability etc.**
Hogeschool Van Amsterdam (HvA); Amsterdam University of Applied Sciences	Provide the best possible education and produce cutting-edge research.	Creating internationally orientated education with cutting-edge research.	Students can give new insights for projects, but are barely involved	Companies do not know to possibilities with students and knowledge institutes	**More specific and visual study programme**

ORGANISATION	INTERESTS	DESIRED SITUATION / OBJECTIVE	EXISTING OR EXPECTED SITUATION AND GAP	CAUSES	POSSIBLE SOLUTIONS
Pakhuis De Zwijger; WAAG Society	Integrating, connecting domains and disciplines, sharing knowledge and experiences, and designing and Imagineering the future of everyday living. Addressing fellow citizens from a position of equality and collaboration.	In its research activities, it explores emerging technologies with a focus on digital sciences, and how they interact with society. It stimulates collaboration towards a liveable city, puts urgent matters on the agenda, linking them to the creative industry	The citizen perspective is under lighted in development projects	Focus too much on economic benefits	**Organizing events and pilot projects to show what is possible**
Private companies (Alliander, Amsterdam Arena, Arcadis, KPN, PostNL)	Economic profit & Business continuity	A Smart City that provides for business development projects in an efficient way	Too many initiative take too much time at the drawing board, without real action.	Too many organizations involved without clear role division and a common goal	**At the start of every project, set a clear goal and set of values to contribute to.**
TNO	Connecting people and knowledge to create innovations that boost the competitive strength of industry and the well-being of society in a sustainable way	Providing new technical solutions for Smart City Projects	Citizens do not know how to use new technological developments	New projects and citizens are anxious in adapting to new technological development	**Citizen involvement in technological development projects**

Actor problem formulation Hamburg

Table 11.6 Actor description and problem formulation Hamburg

ORGANISATION	INTERESTS	DESIRED SITUATION / OBJECTIVE	EXISTING OR EXPECTED SITUATION AND GAP	CAUSES	POSSIBLE SOLUTIONS
City Science Lab	Representing citizens by evaluating the importance of the Public value in the policy agenda	Smart City projects where Public value is always a main concern	Development projects do not consider the effects on the public	Sole focus on economic profit	**Citizen engagement and regulations for a Public value added**
Governmental Organizations (City of Hamburg)	Suitable living environment for all citizens in the city; Facilitator of several Smart City projects (e.g. smartPORT).	Make Hamburg a leading city for smart development and liveability.	Project developers and citizens are not behind the same idea of the future	The transition from the traditional trade city to a 'smart' city of development	**Citizen engagement in the development and empowering them.**
Hafencity Hamburg	Successful development of the HafenCity urban area in Hamburg.	Answering both local needs and global requirements by development of the HafenCity area in Hamburg	Plans of the governmental organizations do not need the requirements of big enterprises.	Building instead of measuring the needs first	**Monitoring the needs of target citizens and organizations**
Hamburg Port Authority (HPA) & Hamburger Hafen Und Logistik Ag (HHLA)	Aims for efficiency, safety and profitability in port management.	HPA is aiming to make the Port of Hamburg a "smartPORT"; HHLA wants to lead the way in smart logistics for the Port of Hamburg	Development is slow and can be more efficient	The transition from the traditional trade city to a 'smart' city of development	**Focus on training employees with new technologies**
Knowledge Institutions (HCU; HAW; UH)	Provide and implement knowledge obtained in their research.	Access to projects details for research purposes	Many project details are not available	Lack of openness in business	**Open source development supported by government**
Mlove	Creator of Future City Campus, used for major international events for start-ups and innovation	Take a good position in the network of the Smart City, by initiating events and communication	More connection with companies involved with the Smart City	No room for start-ups and small innovations	**More reliance on trust and new inputs**
Private companies (Cisco; Vattenfall; Hamburg Energie)	Economic benefits and business continuity	Foster innovation and help embrace the opportunities offered by the Smart City of Hamburg.	-	-	**-**

Appendix V. Results interviews

Amsterdam

Organisation: Alliander NV / Amsterdam Smart City Platform
Location: Stadhuis, Amstel 1, Amsterdam
Date: 11-05-2018
Code: MTDB01PV

The participant is involved in the Amsterdam Smart City Platform on behalf of Alliander NV. He has also experience as Program developer at Global Smart Cities and Community Coalition. His recent focus is on how to add a Public value to the Smart City projects throughout the city of Amsterdam. In his opinion, the main focus of the Smart City projects in Amsterdam is on the success of the projects itself by building a coalition and working groups. The projects are not executed with the goal of creating an added value for the citizens. A new process guideline of starting a project should improve this aspect and secure a Public value as the main goal of every initiative.

Alliander NV / Amsterdam Smart City Platform

<-- Most disagree						Most agree -->
-3	-2	-1	0	1	2	3
4	9	7	1	5	10	2
16	11	8	3	6	19	22
	23	12	14	13	20	
		15	17	21		
			18			
			24			

Figure 11.1 Statement Distribution MTDB01PV

Why are these statements at the extremes?
Most agree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

In a Smart City, the organisations should dare to be open for input. In this way, you can create multiple goals and also create an added value for the public.

22) Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.

Transparency is essential. A Smart City is not about being a collection of 'shiny tech-objects', but about what you do with the technology to create something extra for the citizens.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

The Smart City should be about working together, a collaboration between different actors. Not just one should be responsible for the initiative.

16) Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.

Alliander has always put information security in a central position during their projects.

Do you miss specific statements?

Most statements focused on what public and/or private organisations can do for the citizens. Why not about what the citizens can do to improve the city? Turning the question around can create a completely new perspective.

Do you suggest someone else I should talk to about this topic?

The HvA (Hogeschool van Amsterdam; Amsterdam University of Applied Sciences) did a comparative research on several Smart City projects.

Organisation: Amsterdam University of Applied Sciences
Location: Venture Studios, Wibautstaat 3b, Amsterdam
Date: 23-05-2018
Code: MTDB02MP

The participant is project manager Smart City Academy at the Amsterdam University of Applied Sciences. The goal of this academy is to unite researchers focussing on Smart City projects from all faculties, in an attempt to create a multi-disciplinary platform that can evaluate and support all different types of Smart City projects. The report "Organising Smart City Projects: Lessons from Amsterdam" by Van Winden *et al.* (2016) is a result of the effort the Amsterdam University of Applied Sciences has put into Smart City research. The participant was also involved in the development of the "NL Smart City strategy: The future of living ", as created by the Dutch Government (2017).

Amsterdam University of Applied Sciences

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	11	7	3	5	1	2
9	17	12	6	10	8	20
	23	15	18	13	14	
		16	19	22		
			21			
			24			

Figure 11.2 Statement Distribution MTDB02MP

Why are these statements at the extremes?
Most agree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

In a Smart City, it is important to create support in public communities. This support is necessary for upscaling, the next phase of Smart City implementation.

20) The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.

Technology is not the solution to the problems or the goal of the development, technology should have a supportive function towards specific goals.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

Both initiatives can work. The focus should not be on only one of these.

9) The Smart City should focus on the use of real-time information to respond rapidly to emergencies and threats, because the larger the population gets, the quicker the emergency response needs to be.

This will be too much towards checking, this should not be the motivation for the Smart City.

Do you miss specific statements?

- None of the statements focus on how the Smart City could actually be used to create value for the citizens.
- The statements now mainly focus on the first step of the development, the upscaling of the projects is underexposed.

Do you suggest someone else I should talk to about this topic?

It might be a good idea to talk to large private companies involved in the Smart City, for example KPN.

Organisation: KPN
Location: KPN International, Maanplein 55, Den Haag
Date: 30-05-2018
Code: MTDB03RV

The participant is a Data Consultant in Smart City & Smart mobility at KPN. His main focus is to find the need for digital solutions to fix social-world problems for KPN new businesses. In his opinion, the Smart City can be seen a planet as the heart and the surrounding moons as technological solutions. The moons will only stay in orbit when there is a two-way attraction, meaning that not all technical solutions will fit for every Smart City.
At KPN they do not only focus on the Smart City of Amsterdam, but also on the second layer of smart cities like Almere, Delft, and Eindhoven. They belief that it is much easier to formulate actual needs of the people when you search on a smaller scale.

KPN

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
2	7	4	3	1	8	5
16	11	9	13	6	10	24
	12	18	15	14	20	
		23	17	21		
			19			
			22			

Figure 11.3 Statement Distribution MTDB03RV

Why are these statements at the extremes?
Most agree:

5) Smart Cities are about working together, about cooperation, about collectively working towards a common goal.

Smart City = Stakeholder innovation. You can see a Smart City as one big jigsaw-puzzle, where all the stakeholders have a separate piece.

24) Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.

Intrinsic motivation should be the key driver for every initiative in the Smart City. Creating a value in an attempt to really make a difference for the people living in the city.

Most disagree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

Participation is a contribution to the heart in the planet analogy. This is about validating the desires of the public. The government should than make decision based on that knowledge.

16) Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.

It is the role of the government to protect the added value. This is not only economic value, but also social or Public value.

Do you miss specific statements?
We believe that there are three different types of data sources if there is a need for information: (1) intern, within the organisation itself, (2) extern, in the city around the organisation, and (3) new sources, like sensors and other ITs. In a Smart City, organisations are tempted to use new data-sources to find the answer to their questions. But most of the time, the answer is already present in the city (extern), or even within the company itself (intern). Data management of the data that already exists should be the first focus, instead of only added new data.

Some statements automatically assume that mobile applications are required for Smart City data gathering, this is not true by definition.

Do you suggest someone else I should talk to about this topic?
TU Delft, EWI faculty provides technical innovation for our research.

Organisation: WAAG Society
Location: Waag, Nieuwmarkt 4, Amsterdam
Date: 28-05-2018
Code: MTDB04CB

The participant is a project developer at WAAG for the Future Internet Lab. On behalf of WAAG, he worked together with the Joint Research Centre (JRC) of the European Commission towards the creation of a so-called eCitizen Charter. This was multi-lateral effort to centralized the way online data is stored, secured, and the rights people have on it. WAAG is currently active is multiple Smart City projects, with the main goal to ensure that the public is involved and to make sure that public rights are not violated in terms of privacy and security.

WAAG Society

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	7	11	6	1	14	2
16	9	12	5	3	20	10
	13	18	17	5	22	
		24	19	8		
			21			
			23			

Figure 11.4 Statement Distribution MTDB04CB

Why are these statements at the extremes?
Most agree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

10) Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.

Both statements cover the same topic. It's not about the technology itself, but about what you can do with this technology. You can only find the possibilities of the technology by working closely together with the citizens. The Smart City should serve the people, not the corporations.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

The government should decide about the structure of the Smart City, because their role is to represent the citizens. There is plenty of room for private input, as long as it fits within the framework set by the governmental organisations.

16) Although security and risk practices are extremely important for the confidentiality and integrity of the data being transmitted, information security is not a priority when infrastructure rollouts happen.

Data security has always a central position in Smart City projects, and it should be like that. Information security is very important and all projects should be developed with the impact on privacy in mind.

Do you miss specific statements?
Most of the statements are about the focus and initiatives of the Smart City. It would be very interesting to focus more on the implementation process of the projects. To find the challenges and to find out what we really want with the innovations.

Do you suggest someone else I should talk to about this topic?
CTO office Amsterdam
Citizen Data Lab HvA

Organisation: Citizen Data Lab
Location: Benno Premselahuis, Rhijnspoorplein 1, Amsterdam
Date: 05-06-218
Code: MTDB05WM

The participant is a researcher at Citizen Data Lab (CDL). His main focus is on community empowerment and data awareness. He believes that the Smart City should empower citizens to get actively involved in the process of improving the city and that they should be aware of the data that is and can be collected by the city and the citizens themselves. He also believes that a main strength of the Smart City is in the creation of platform.

Citizen Data Lab

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
13	4	9	3	19	5	2
23	7	11	6	20	14	10
	15	16	8	22	18	
		17	12	1		
			21			
			24			

Figure 11.5 Statement Distribution MTDB05WM

Why are these statements at the extremes?
Most agree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

We should stop trying to make the city smart, and start by focussing on making the citizens smart. Empowerment of the citizen is crucial for a well-developed Smart City.

10) Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.

Technology is never neutral, and will therefore not always provide the best solution.

Most disagree:

13) Restructuring is one of the most important aspects of local economic development, as it relates to the durability of economic vitality in changing times.

The focus should not be on restructuring, it definitely isn't a requirement for successful Smart City development.

23) The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.

This is a very top-down approach, like the Smart City is an entity on itself, almost a dictatorship. This is not what the Smart City should be.

Do you miss specific statements?
The main focus right now is on the local organisations and governments, maybe some statements should also entail the role of the central government (state or even EU).

Do you suggest someone else I should talk to about this topic?
Some focus groups might be interesting, like Energie Comissie, 02025, or De Gezonde Stad.

Organisation: 02025
Location: Oldschool Amsterdam, Gaasterlandstraat 5, Amsterdam
Date: 14-06-218
Code: MTDB06TH

The participant is event manager at 02025. He is one of the initiators of 02025, that strives to stop all CO_2 emission in Amsterdam by 2025. During the regularly organised event "Energieontbijt", local citizens and experts are brought in contact to collaboratively find sustainable solutions in the energy transition. The main goal is to create awareness among the citizens and to provide the means to actually make a change.

02025

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
12	7	4	3	2	5	1
19	11	9	6	14	10	24
	16	13	8	18	20	
		23	15	21		
			17			
			22			

Figure 11.6 Statement Distribution MTDB06TH

Why are these statements at the extremes?
Most agree:

1) 'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.

The result/effect of every top-down solution fully depends on how the citizens handle it. If the public doesn't want it, the solution will not work.

24) Intrinsic motivation and trust among the stakeholders is key in tackling societal challenges.

Especially trust. Without trust, there will be no acceleration in the process and initiatives will not work. Innovation cannot work when there is no trust, since there need to be room for error and mistakes in the innovation process.

Most disagree:

12) All projects should be built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.

Informing is the lowest level of citizen participation. It should not be about informing, but about active cooperation towards a common goal.

19) A bottom-up methodology (open source data, where the input comes from the citizens and not from the companies) can provide the best results.

Bottom-up alone will not be enough. To collectively move forward, you have to find the perfect mix of bottom-up and top-down. One will not suffice. The Amsterdam Approach is a good example.

Do you miss specific statements?
The statements already cover this to some extent, but to highlight: Working for people/citizens, without involving them in the process, will result in you actually working against them.

Organisation: AVEnergie
Location: Oldschool Amsterdam, Gaasterlandstraat 5, Amsterdam
Date: 14-06-218
Code: MTDB07JK

The participant is a private entrepreneur with the goal to help people be fully self-sufficient in their energy demand. This includes advice on possible strategies of energy-efficiency and product to become self-sufficient. His fascination for technological developments helps to stay on top of the innovation game in the energy transition.

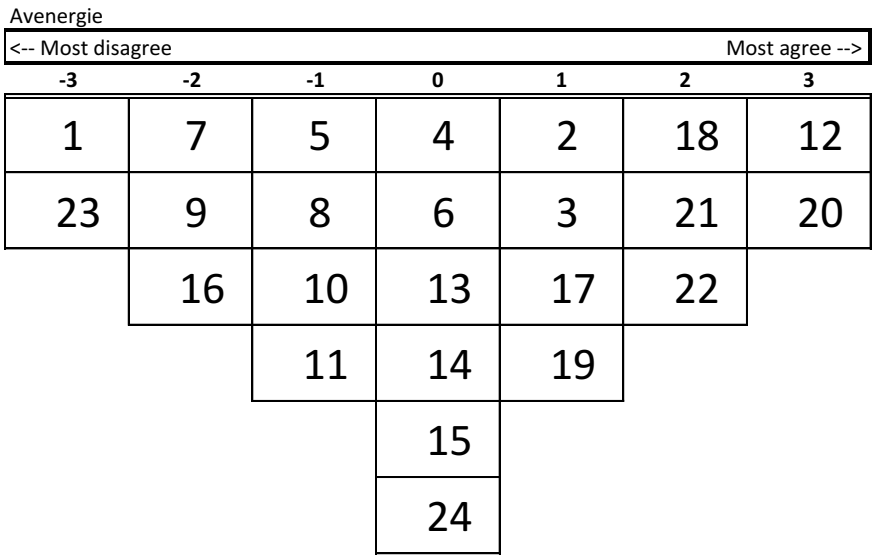


Figure 11.7 Statement Distribution MTDB07JK

Why are these statements at the extremes?
Most agree:
12) All projects should be built around informing citizens, entrepreneurs and the public sector about their energy consumption and educating them about how to manage it more prudently.

This statement includes all important aspects. It includes the three sectors and the way to manage it. This is also my main focus in business.

20) The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.

Technological innovation is beautiful, but it should be always a product of a common goal. It is about working together towards that common goal, where technology can help to get there.

Most disagree:

1) 'Technology-pushed' solutions have often failed to engage the citizens and the public authorities themselves, who didn't take ownership of the 'smart' services experimented in this way.

A technology push will never work when citizens just have to adapt to it. There should always be a choice.

23) The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.

This should not be the focus of the Smart City. The solutions for these problems are already available, you don't need new technology for that.

Do you miss specific statements?

A bit more specific about the co-creation of common goals and tackling societal challenges.

Hamburg

Organisation: HafenCity University Hamburg
Location: Überseeallee 16, Hamburg
Date: 13-06-2018
Code: MTDB11JT

The participant is a researcher at the HafenCity University Hamburg, in the sector of Urban and Regional Economic Studies. In the past, his focus has been on large-scale project implementation. Currently, the participant is working on a research project that attempts to standardize Smart City development. The case study used by the participant, in the Smart City of Singapore. Although he isn't directly studying the Smart City of Hamburg, the participant does follow the developments by supervising student projects from HafenCity University.

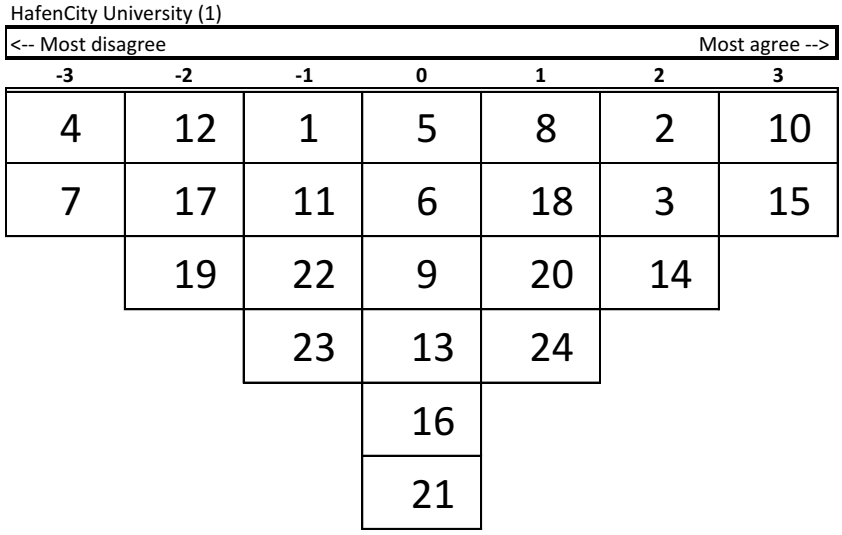


Figure 11.8 Statement Distribution MTDB11JT

Why are these statements at the extremes?
Most agree:

10) Progressive smart cities must start with people and the human capital side of the equation, rather than blindly believing that IT itself can automatically transform and improve cities.

Every development should start with the people, and not with IT. Improving the city for the citizen, should be the main goal of development projects.

15) The large number of interconnected devices in the Smart City require a central system of defence. Layered security approaches and transparent standards for privacy are crucial to the construction of smart cities.

The key to successful development projects is security. Without security, there will be no positive future.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

It's about public goods, thus a part has to be city-driven. The private sector alone, is not likely to act from the citizens' interest. This is the main function of the public sector.

7) In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.

Everything that has to do with innovation, cannot be limited to economic viability.

Do you miss specific statements?

The role of big IT-companies. Here in Germany, CISCO plays an important role. This is not represented in the statements.

Do you suggest someone else I should talk to about this topic?

The City Science Lab

Organisation: HafenCity University Hamburg
Location: Überseeallee 16, Hamburg
Date: 13-06-2018
Code: MTDB12FM

The participant is a researcher at the HafenCity University Hamburg, in the sector of Urban and Regional Economics. He has a background in Social Political Sciences. Currently, the participant is working on a research project that attempts to standardize Smart City development. The case study used by the participant, in the Smart City of Amsterdam.

HafenCity University (2)

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	16	11	3	1	13	2
7	23	12	6	5	14	8
	24	17	9	10	18	
		19	15	22		
			20			
			21			

Figure 11.9 Statement Distribution MTDB12FM

Why are these statements at the extremes?
Most agree:

2) The Smart City vision can't be achieved without the participation of the public and their contribution with the government in making decisions.

The goal is to set priorities and find key elements in the decision making. In that way, the best results can be achieved.

8) Sharing and spreading the knowledge acquired during the path towards the Smart City transformation are actions of crucial importance.

Transparency in very important, not only for the government. Knowledge should be considered a common good.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

It should be a combination of both. The Smart City is about the collaboration between the public sector, the private sector and the citizens.

7) In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.

It is unlikely that there is economic viability in innovative projects.

Do you miss specific statements?

Role of large private companies; asymmetry in info/data; the commercialization of the Smart City

Do you suggest someone else I should talk to about this topic?

University of Hamburg, research project on Data management in Smart City.

Organisation: City Science Lab
Location: Überseeallee 16, Hamburg
Date: 20-06-2018
Code: MTDB13TH

The participant is a researcher at the City Science Lab in Hamburg. He has a background in Architecture and Urban Planning. The participant's current focus includes the socio-cultural impacts of Smart City technologies in the field of urban planning. He is also involved in the research project SmartSquare, that focusses on the revitalization of an inner-city square through the implementation of digital cultural services. In his opinion, the developments in the city are referred to as the Smart City of Hamburg, just because it makes it easier to communicate. It is also referred to as the digitalization of the City. It is the transition from the original position of Hamburg as a trade city, towards an innovation driven city.

City Science Lab

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
7	11	4	10	1	2	14
23	12	9	15	6	3	22
	16	13	17	8	5	
		24	18	21		
			19			
			20			

Figure 11.10 Statement Distribution MTDB13TH

Why are these statements at the extremes?
Most agree:

14) The Smart City governance should work closely with citizens, because this will accelerate Smart City development.

It's important to find the users perspective. By not using this perspective in the development, the projects will eventually fail.

22) Smart cities should be transparent cities. Information technology should facilitate the open government movement in any municipality, especially in a smart community.

We live in a time where a lot of people want to engage in the decision-making process, everyone wants to get information. A Smart City creates the possibility of more transparent governing.

Most disagree:

7) In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.

When you only focus on economic viability, it stops little things from being tested. These little things can turn out to be equally important.

23) The Smart City should focus on reducing traffic congestion by encouraging the use of public transportation.

Cars are a part of the German Identity, you can't simply take that away from the citizens. Other ways to solve the problem of making people use public transportation more should be explored. The Smart City should not focus on this.

Do you miss specific statements?

The pessimistic view of the Smart City, that it is "just trendy".

Do you suggest someone else I should talk to about this topic?

-

Organisation:	Hamburg University; Universität Hamburg
Location:	Fakultät für Mathematik, Informatik und Naturwissenschaften, Informatik, Vogt-Kölln-Straße 30, Hamburg
Date:	21-06-2018
Code:	MTDB14EB

The participant is a professor at Hamburg University, focusing mainly on socio-technical system design at the Department of Informatics of the University of Hamburg. Currently, the participant is working on the Civitas Digitalis project. The aim of this project is to support the development of new services for the smart service city of the future and to increase the quality of the life of citizens by means of citizens' participation in urban development.[1]

Hamburg University

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	11	5	9	1	3	6
7	13	12	16	2	10	20
	19	14	17	8	22	
		18	21	15		
			23			
			24			

Figure 11.11 Statement Distribution MTDB14EB

Why are these statements at the extremes?
Most agree:

6) Creativity is recognized as a key driver to Smart City, and thus people, education, learning and knowledge have central importance to Smart City.

Innovation can only be achieved collaboratively, thus the Smart City should create digital competency among the citizens and educate people on how to handle the data.

20) The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.

The human part should always be centred. Technologies should be used for their usefulness, on how it can contribute to a better quality of life.

[1] https://civitas-digitalis.informatik.uni-hamburg.de/en/homepage/

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

I've seen success and failures in both approaches. One cannot be defined as better, by definition. Focus on both is thus essential.

7) In term of economic viability, only the most advantageous projects should be considered for potential large-scale implementation.

Other goals should matter as well. Economic viability should not be the only thing to strive for.

Do you miss specific statements?

-

Organisation: HafenCity Hamburg GmbH
Location: Osakaallee 11, Hamburg
Date: 22-06-2018
Code: MTDB15PP

The participant is Assistant to Executives at HafenCity Hamburg GmbH, with a main focus on two of the development/building projects in the HafenCity area. He uses his background in Urban Studies to help in successfully developing the world's largest inner city development projects, HafenCity. Their main focus in these development projects, is to be sustainable and smart in energy, building scale, and mobility. HafenCity constantly seeks increasing sustainability by formulating new standard for the projects.

HafenCity Hamburg GmbH

<-- Most disagree						Most agree -->
-3	**-2**	**-1**	**0**	**1**	**2**	**3**
4	7	18	2	1	8	3
17	13	11	12	6	22	20
	16	19	5	10	23	
		9	14	15		
			21			
			24			

Figure 11.12 Statement Distribution MTDB15PP

Why are these statements at the extremes?
Most agree:

3) We can only solve the challenges of urbanization by working closely with all of the players in politics and business.

Working closely together with all the players is a key success factor for HafenCity. The diatomic thinking between the players prevents innovation.

20) The role of technologies in smart cities should be in enabling sustainable development of cities, not in the new technology as an end in itself.

Experience from projects in the first decade of the HafenCity shows that tech-driven projects are not effective.

Most disagree:

4) A Smart City initiative should come from a private innovation platform, not as a city driven program.

For HafenCity, regulation is a key instrument. City-driven programming is important to facilitate de-commodification.

17) From a Smart City perspective, success within the domain of smart living can be achieved by providing environmental well-being, and material well-being.

Material and environment is not the only thing that is important. It is one-sided to ignore the economic and social aspects.

Do you miss specific statements?

-

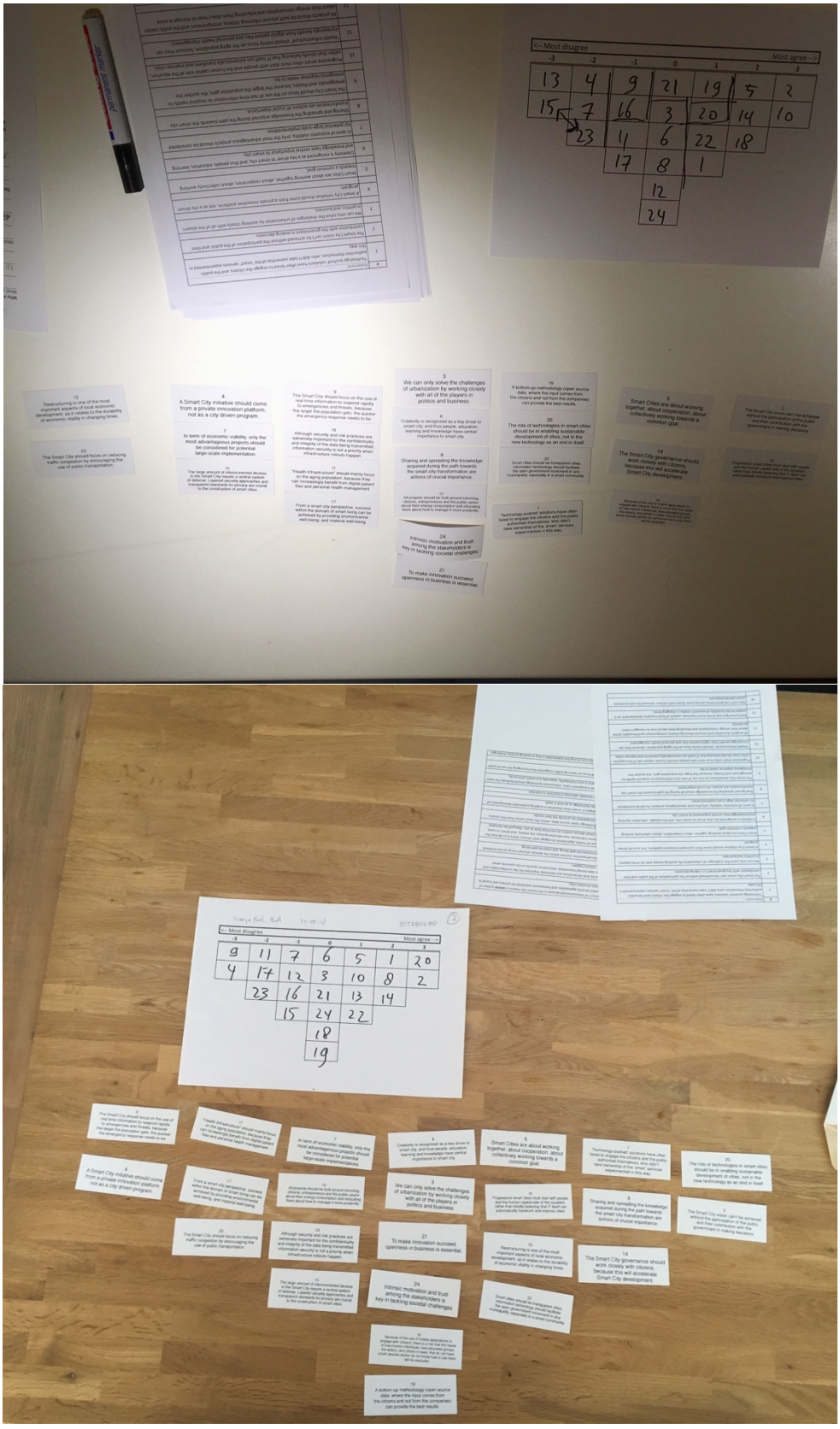


Figure 11.13 Results of a Q-interview in practice

Appendix VI. Q-Analysis

PQMethod2.35 MTDBv1 PAGE 1
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Correlation Matrix Between Sorts

SORTS	1	2	3	4	5	6	7	8	9	10	11	12
1 MTDB01PV	100	72	38	74	65	43	50	31	54	63	44	37
2 MTDB02MP	72	100	43	74	66	57	25	50	72	63	46	51
3 MTDB03RV	38	43	100	43	31	69	6	34	26	44	37	43
4 MTDB04CB	74	74	43	100	72	56	24	54	62	71	63	68
5 MTDB05WM	65	66	31	72	100	53	32	44	57	66	37	31
6 MTDB06TH	43	57	69	56	53	100	1	54	43	53	50	40
7 MTDB07JK	50	25	6	24	32	1	100	9	19	34	18	13
8 MTDB11JT	31	50	34	54	44	54	9	100	60	46	57	51
9 MTDB12FM	54	72	26	62	57	43	19	60	100	69	37	35
10 MTDB13TH	63	63	44	71	66	53	34	46	69	100	47	41
11 MTDB14EB	44	46	37	63	37	50	18	57	37	47	100	76
12 MTDB15PP	37	51	43	68	31	40	13	51	35	41	76	100

Unrotated Factor Matrix

	Factors			
	1	2	3	4
SORTS				
1 MTDB01PV	0.7638	0.3813	0.1827	0.0389
2 MTDB02MP	0.8369	0.1368	0.0217	0.0133
3 MTDB03RV	0.5368	-0.2884	0.0832	-0.3337
4 MTDB04CB	0.8979	0.0176	0.0011	0.0757
5 MTDB05WM	0.7397	0.2926	0.0996	-0.1055
6 MTDB06TH	0.6879	-0.2981	0.0897	-0.4681
7 MTDB07JK	0.2907	0.3357	0.1353	0.0752
8 MTDB11JT	0.6474	-0.2296	0.0499	0.0570
9 MTDB12FM	0.7116	0.1776	0.0356	0.0039
10 MTDB13TH	0.8035	0.1769	0.0355	-0.1027
11 MTDB14EB	0.6772	-0.3759	0.1555	0.3130
12 MTDB15PP	0.6410	-0.3458	0.1269	0.3904
Eigenvalues	5.9237	0.9112	0.1223	0.6188
% expl.Var.	49	8	1	5

PQMethod2.35 MTDBv1 PAGE 2
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Cumulative Communalities Matrix

	Factors 1 Thru			
	1	2	3	4
SORTS				
1 MTDB01PV	0.5833	0.7287	0.7621	0.7636
2 MTDB02MP	0.7004	0.7191	0.7196	0.7198
3 MTDB03RV	0.2882	0.3714	0.3783	0.4897
4 MTDB04CB	0.8063	0.8066	0.8066	0.8124
5 MTDB05WM	0.5472	0.6328	0.6428	0.6539
6 MTDB06TH	0.4732	0.5621	0.5701	0.7892
7 MTDB07JK	0.0845	0.1972	0.2155	0.2212
8 MTDB11JT	0.4191	0.4718	0.4743	0.4776
9 MTDB12FM	0.5063	0.5378	0.5391	0.5391
10 MTDB13TH	0.6455	0.6769	0.6781	0.6887
11 MTDB14EB	0.4586	0.5999	0.6240	0.7220
12 MTDB15PP	0.4109	0.5306	0.5467	0.6990
cum% expl.Var.	49	57	58	63

Factor Matrix with an X Indicating a Defining Sort

	Loadings		
QSORT	1	2	3
1 MTDB01PV	0.8120X	0.2512	0.2028
2 MTDB02MP	0.6525X	0.3854	0.3470
3 MTDB03RV	0.1378	0.2391	0.6429X
4 MTDB04CB	0.6039	0.5195	0.3763
5 MTDB05WM	0.7115X	0.1833	0.3322
6 MTDB06TH	0.2250	0.2399	0.8245X
7 MTDB07JK	0.4627X	0.0399	-0.0423
8 MTDB11JT	0.2646	0.5125X	0.3715
9 MTDB12FM	0.6025X	0.2922	0.2769
10 MTDB13TH	0.6577X	0.2734	0.4041
11 MTDB14EB	0.2038	0.7839X	0.2567
12 MTDB15PP	0.2009	0.7944X	0.1655
% expl.Var.	27	19	16
EV	3.1872	2.2998	1.9797

PQMethod2.35 MTDBv1 PAGE 3
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Free Distribution Data Results

QSORT	MEAN	ST.DEV.
1 MTDB01PV	0.000	1.719
2 MTDB02MP	0.000	1.719
3 MTDB03RV	0.000	1.719
4 MTDB04CB	0.000	1.719
5 MTDB05WM	0.000	1.719
6 MTDB06TH	0.000	1.719
7 MTDB07JK	0.000	1.719
8 MTDB11JT	0.000	1.719
9 MTDB12FM	0.000	1.719
10 MTDB13TH	0.000	1.719
11 MTDB14EB	0.000	1.719
12 MTDB15PP	0.000	1.719

Factor Scores with Corresponding Ranks

		Factors					
No.	Statement	No.	1		2		3
1	1 Citizen Involvement	1	0.37	10	0.46	9	1.50 2
2	2 Citizen involvement	2	1.91	1	0.46	10	-0.12 15
3	3 Compromise	3	0.27	13	1.59	2	0.00 14
4	4 Compromise	4	-1.61	23	-1.95	24	-0.62 19
5	5 Integrity	5	0.84	6	-0.27	14	1.43 3
6	6 Social innovation	6	0.33	11	1.10	4	0.19 10
7	7 Reliability	7	-1.28	21	-1.66	23	-1.25 21
8	8 Social innovation	8	0.30	12	0.94	6	0.37 8
9	9 Sustainability	9	-1.11	19	-0.29	15	-0.62 19
10	10 Human dignity	10	0.98	4	1.10	3	1.25 5
11	11 Service Quality	11	-1.14	20	-0.92	19	-1.25 21
12	12 Sustainability	12	-0.46	17	-0.46	16	-1.68 24
13	13 Cultural heritage	13	-0.01	14	-1.11	22	-0.44 16
14	14 Social innovation	14	0.97	5	-0.09	13	0.62 7
15	15 Secrecy	15	-0.59	18	0.83	7	0.00 14
16	16 Secrecy	16	-1.40	22	-0.57	18	-1.43 23
17	17 Sustainability	17	-0.38	16	-1.04	21	0.00 14
18	18 Equal opportunities	18	0.55	7	-0.46	17	0.25 9
19	19 Social innovation	19	0.54	8	-1.01	20	-1.31 22
20	20 Sustainability	20	1.05	3	1.76	1	1.25 5
21	21 Openness	21	0.44	9	0.00	12	0.62 7
22	22 Openness	22	1.42	2	1.02	5	0.00 14
23	23 Robustness	23	-1.71	24	0.48	8	-0.62 19
24	24 Integrity	24	-0.28	15	0.09	11	1.87 1

PQMethod2.35 MTDBv1 PAGE 4
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Correlations Between Factor Scores

	1	2	3
1	1.0000	0.5260	0.5473
2	0.5260	1.0000	0.5260
3	0.5473	0.5260	1.0000

Factor Scores -- For Factor 1

No.	Statement	No.	Z-SCORES
2	2 Citizen involvement	2	1.907
22	22 Openness	22	1.417
20	20 Sustainability	20	1.053
10	10 Human dignity	10	0.979
14	14 Social innovation	14	0.973
5	5 Integrity	5	0.839
18	18 Equal opportunities	18	0.550
19	19 Social innovation	19	0.541
21	21 Openness	21	0.436
1	1 Citizen Involvement	1	0.375
6	6 Social innovation	6	0.328
8	8 Social innovation	8	0.305
3	3 Compromise	3	0.269
13	13 Cultural heritage	13	-0.006
24	24 Integrity	24	-0.282
17	17 Sustainability	17	-0.376
12	12 Sustainability	12	-0.464
15	15 Secrecy	15	-0.592
9	9 Sustainability	9	-1.105
11	11 Service Quality	11	-1.140
7	7 Reliability	7	-1.285
16	16 Secrecy	16	-1.398
4	4 Compromise	4	-1.612
23	23 Robustness	23	-1.710

PQMethod2.35 MTDBv1 PAGE 5
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Factor Scores -- For Factor 2

No.	Statement	No.	Z-SCORES
20	20 Sustainability	20	1.763
3	3 Compromise	3	1.585
10	10 Human dignity	10	1.105
6	6 Social innovation	6	1.098
22	22 Openness	22	1.021
8	8 Social innovation	8	0.936
15	15 Secrecy	15	0.834
23	23 Robustness	23	0.480
1	1 Citizen Involvement	1	0.465
2	2 Citizen involvement	2	0.455
24	24 Integrity	24	0.092
21	21 Openness	21	0.000
14	14 Social innovation	14	-0.086
5	5 Integrity	5	-0.271
9	9 Sustainability	9	-0.286
12	12 Sustainability	12	-0.455
18	18 Equal opportunities	18	-0.465
16	16 Secrecy	16	-0.573
11	11 Service Quality	11	-0.920
19	19 Social innovation	19	-1.012
17	17 Sustainability	17	-1.044
13	13 Cultural heritage	13	-1.114
7	7 Reliability	7	-1.662
4	4 Compromise	4	-1.948

PQMethod2.35 MTDBv1 PAGE 6
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Factor Scores -- For Factor 3

No.	Statement	No.	Z-SCORES
24	24 Integrity	24	1.870
1	1 Citizen Involvement	1	1.498
5	5 Integrity	5	1.433
10	10 Human dignity	10	1.247
20	20 Sustainability	20	1.247
14	14 Social innovation	14	0.623
21	21 Openness	21	0.623
8	8 Social innovation	8	0.372
18	18 Equal opportunities	18	0.251
6	6 Social innovation	6	0.186
15	15 Secrecy	15	0.000
17	17 Sustainability	17	0.000
3	3 Compromise	3	0.000
22	22 Openness	22	0.000
2	2 Citizen involvement	2	-0.121
13	13 Cultural heritage	13	-0.437
9	9 Sustainability	9	-0.623
4	4 Compromise	4	-0.623
23	23 Robustness	23	-0.623
7	7 Reliability	7	-1.247
11	11 Service Quality	11	-1.247
19	19 Social innovation	19	-1.312
16	16 Secrecy	16	-1.433
12	12 Sustainability	12	-1.684

PQMethod2.35 MTDBv1 PAGE 7
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Descending Array of Differences Between Factors 1 and 2

No.	Statement	No.	Type 1	Type 2	Difference
19	19 Social innovation	19	0.541	-1.012	1.553
2	2 Citizen involvement	2	1.907	0.455	1.452
5	5 Integrity	5	0.839	-0.271	1.110
13	13 Cultural heritage	13	-0.006	-1.114	1.107
14	14 Social innovation	14	0.973	-0.086	1.059
18	18 Equal opportunities	18	0.550	-0.465	1.015
17	17 Sustainability	17	-0.376	-1.044	0.668
21	21 Openness	21	0.436	0.000	0.436
22	22 Openness	22	1.417	1.021	0.396
7	7 Reliability	7	-1.285	-1.662	0.377
4	4 Compromise	4	-1.612	-1.948	0.336
12	12 Sustainability	12	-0.464	-0.455	-0.008
1	1 Citizen Involvement	1	0.375	0.465	-0.090
10	10 Human dignity	10	0.979	1.105	-0.126
11	11 Service Quality	11	-1.140	-0.920	-0.220
24	24 Integrity	24	-0.282	0.092	-0.375
8	8 Social innovation	8	0.305	0.936	-0.631
20	20 Sustainability	20	1.053	1.763	-0.711
6	6 Social innovation	6	0.328	1.098	-0.770
9	9 Sustainability	9	-1.105	-0.286	-0.819
16	16 Secrecy	16	-1.398	-0.573	-0.825
3	3 Compromise	3	0.269	1.585	-1.316
15	15 Secrecy	15	-0.592	0.834	-1.426
23	23 Robustness	23	-1.710	0.480	-2.191

PQMethod2.35 MTDBv1 PAGE 8
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Descending Array of Differences Between Factors 1 and 3

No.	Statement	No.	Type 1	Type 3	Difference
2	2 Citizen involvement	2	1.907	-0.121	2.028
19	19 Social innovation	19	0.541	-1.312	1.853
22	22 Openness	22	1.417	0.000	1.417
12	12 Sustainability	12	-0.464	-1.684	1.220
13	13 Cultural heritage	13	-0.006	-0.437	0.431
14	14 Social innovation	14	0.973	0.623	0.350
18	18 Equal opportunities	18	0.550	0.251	0.299
3	3 Compromise	3	0.269	0.000	0.269
6	6 Social innovation	6	0.328	0.186	0.142
11	11 Service Quality	11	-1.140	-1.247	0.106
16	16 Secrecy	16	-1.398	-1.433	0.035
7	7 Reliability	7	-1.285	-1.247	-0.038
8	8 Social innovation	8	0.305	0.372	-0.067
21	21 Openness	21	0.436	0.623	-0.187
20	20 Sustainability	20	1.053	1.247	-0.194
10	10 Human dignity	10	0.979	1.247	-0.268
17	17 Sustainability	17	-0.376	0.000	-0.376
9	9 Sustainability	9	-1.105	-0.623	-0.482
15	15 Secrecy	15	-0.592	0.000	-0.592
5	5 Integrity	5	0.839	1.433	-0.593
4	4 Compromise	4	-1.612	-0.623	-0.989
23	23 Robustness	23	-1.710	-0.623	-1.087
1	1 Citizen Involvement	1	0.375	1.498	-1.123
24	24 Integrity	24	-0.282	1.870	-2.152

PQMethod2.35 MTDBv1 PAGE 9
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Descending Array of Differences Between Factors 2 and 3

No.	Statement	No.	Type 2	Type 3	Difference
3	3 Compromise	3	1.585	0.000	1.585
12	12 Sustainability	12	-0.455	-1.684	1.228
23	23 Robustness	23	0.480	-0.623	1.104
22	22 Openness	22	1.021	0.000	1.021
6	6 Social innovation	6	1.098	0.186	0.912
16	16 Secrecy	16	-0.573	-1.433	0.860
15	15 Secrecy	15	0.834	0.000	0.834
2	2 Citizen involvement	2	0.455	-0.121	0.576
8	8 Social innovation	8	0.936	0.372	0.564
20	20 Sustainability	20	1.763	1.247	0.517
9	9 Sustainability	9	-0.286	-0.623	0.337
11	11 Service Quality	11	-0.920	-1.247	0.327
19	19 Social innovation	19	-1.012	-1.312	0.299
10	10 Human dignity	10	1.105	1.247	-0.142
7	7 Reliability	7	-1.662	-1.247	-0.415
21	21 Openness	21	0.000	0.623	-0.623
13	13 Cultural heritage	13	-1.114	-0.437	-0.677
14	14 Social innovation	14	-0.086	0.623	-0.709
18	18 Equal opportunities	18	-0.465	0.251	-0.716
1	1 Citizen Involvement	1	0.465	1.498	-1.033
17	17 Sustainability	17	-1.044	0.000	-1.044
4	4 Compromise	4	-1.948	-0.623	-1.325
5	5 Integrity	5	-0.271	1.433	-1.703
24	24 Integrity	24	0.092	1.870	-1.777

PQMethod2.35 MTDBv1 PAGE 10
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Factor Q-Sort Values for Each Statement

		Factor Arrays			
No.	Statement	No.	1	2	3
1	1 Citizen Involvement	1	0	1	3
2	2 Citizen involvement	2	3	0	0
3	3 Compromise	3	0	3	0
4	4 Compromise	4	-3	-3	-1
5	5 Integrity	5	1	0	2
6	6 Social innovation	6	0	2	0
7	7 Reliability	7	-2	-3	-2
8	8 Social innovation	8	0	1	1
9	9 Sustainability	9	-1	0	-1
10	10 Human dignity	10	2	2	2
11	11 Service Quality	11	-2	-1	-2
12	12 Sustainability	12	-1	-1	-3
13	13 Cultural heritage	13	0	-2	-1
14	14 Social innovation	14	2	0	1
15	15 Secrecy	15	-1	1	0
16	16 Secrecy	16	-2	-1	-3
17	17 Sustainability	17	-1	-2	0
18	18 Equal opportunities	18	1	-1	1
19	19 Social innovation	19	1	-2	-2
20	20 Sustainability	20	2	3	2
21	21 Openness	21	1	0	1
22	22 Openness	22	3	2	0
23	23 Robustness	23	-3	1	-1
24	24 Integrity	24	0	0	3

Variance = 2.833 St. Dev. = 1.683

PQMethod2.35 MTDBv1 PAGE 11
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Factor Q-Sort Values for Statements sorted by Consensus vs. Disagreement (Variance across Factor Z-Scores)

		Factor Arrays		
No.	Statement	No.	1	2	3
10	10 Human dignity	10	2	2	2
11	11 Service Quality	11	-2	-1	-2
7	7 Reliability	7	-2	-3	-2
21	21 Openness	21	1	0	1
8	8 Social innovation	8	0	1	1
20	20 Sustainability	20	2	3	2
9	9 Sustainability	9	-1	0	-1
16	16 Secrecy	16	-2	-1	-3
6	6 Social innovation	6	0	2	0
18	18 Equal opportunities	18	1	-1	1
17	17 Sustainability	17	-1	-2	0
14	14 Social innovation	14	2	0	1
13	13 Cultural heritage	13	0	-2	-1
1	1 Citizen Involvement	1	0	1	3
4	4 Compromise	4	-3	-3	-1
12	12 Sustainability	12	-1	-1	-3
15	15 Secrecy	15	-1	1	0
22	22 Openness	22	3	2	0
3	3 Compromise	3	0	3	0
5	5 Integrity	5	1	0	2
19	19 Social innovation	19	1	-2	-2
2	2 Citizen involvement	2	3	0	0
23	23 Robustness	23	-3	1	-1
24	24 Integrity	24	0	0	3

Factor Characteristics

	Factors		
	1	2	3
No. of Defining Variables	6	3	2
Average Rel. Coef.	0.800	0.800	0.800
Composite Reliability	0.960	0.923	0.889
S.E. of Factor Z-Scores	0.200	0.277	0.333

PQMethod2.35 MTDBv1 PAGE 12
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Standard Errors for Differences in Factor Z-Scores

(Diagonal Entries Are S.E. Within Factors)

Factors	1	2	3
1	0.283	0.342	0.389
2	0.342	0.392	0.434
3	0.389	0.434	0.471

Distinguishing Statements for Factor 1

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q-SV) and the Z-Score (Z-SCR) are Shown.

		Factors		
		1	2	3
No. Statement	No.	Q-SV Z-SCR	Q-SV Z-SCR	Q-SV Z-SCR
2 2 Citizen involvement	2	3 1.91*	0 0.46	0 -0.12
19 19 Social innovation	19	1 0.54*	-2 -1.01	-2 -1.31
23 23 Robustness	23	-3 -1.71*	1 0.48	-1 -0.62

PQMethod2.35 MTDBv1 PAGE 13
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

Distinguishing Statements for Factor 2

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q-SV) and the Z-Score (Z-SCR) are Shown.

		Factors		
		1	2	3
No. Statement	No.	Q-SV Z-SCR	Q-SV Z-SCR	Q-SV Z-SCR
3 3 Compromise	3	0 0.27	3 1.59*	0 0.00
6 6 Social innovation	6	0 0.33	2 1.10	0 0.19
23 23 Robustness	23	-3 -1.71	1 0.48	-1 -0.62
5 5 Integrity	5	1 0.84	0 -0.27*	2 1.43
16 16 Secrecy	16	-2 -1.40	-1 -0.57	-3 -1.43

Distinguishing Statements for Factor 3

(P < .05 ; Asterisk (*) Indicates Significance at P < .01)

Both the Factor Q-Sort Value (Q-SV) and the Z-Score (Z-SCR) are Shown.

		Factors		
		1	2	3
No. Statement	No.	Q-SV Z-SCR	Q-SV Z-SCR	Q-SV Z-SCR
24 24 Integrity	24	0 -0.28	0 0.09	3 1.87*
1 1 Citizen Involvement	1	0 0.37	1 0.46	3 1.50
22 22 Openness	22	3 1.42	2 1.02	0 0.00
4 4 Compromise	4	-3 -1.61	-3 -1.95	-1 -0.62
23 23 Robustness	23	-3 -1.71	1 0.48	-1 -0.62
12 12 Sustainability	12	-1 -0.46	-1 -0.46	-3 -1.68*

PQMethod2.35 MTDBv1 PAGE 14
Path and Project Name: c:/pqmethod/projects/MTDBv1 Aug 2 18

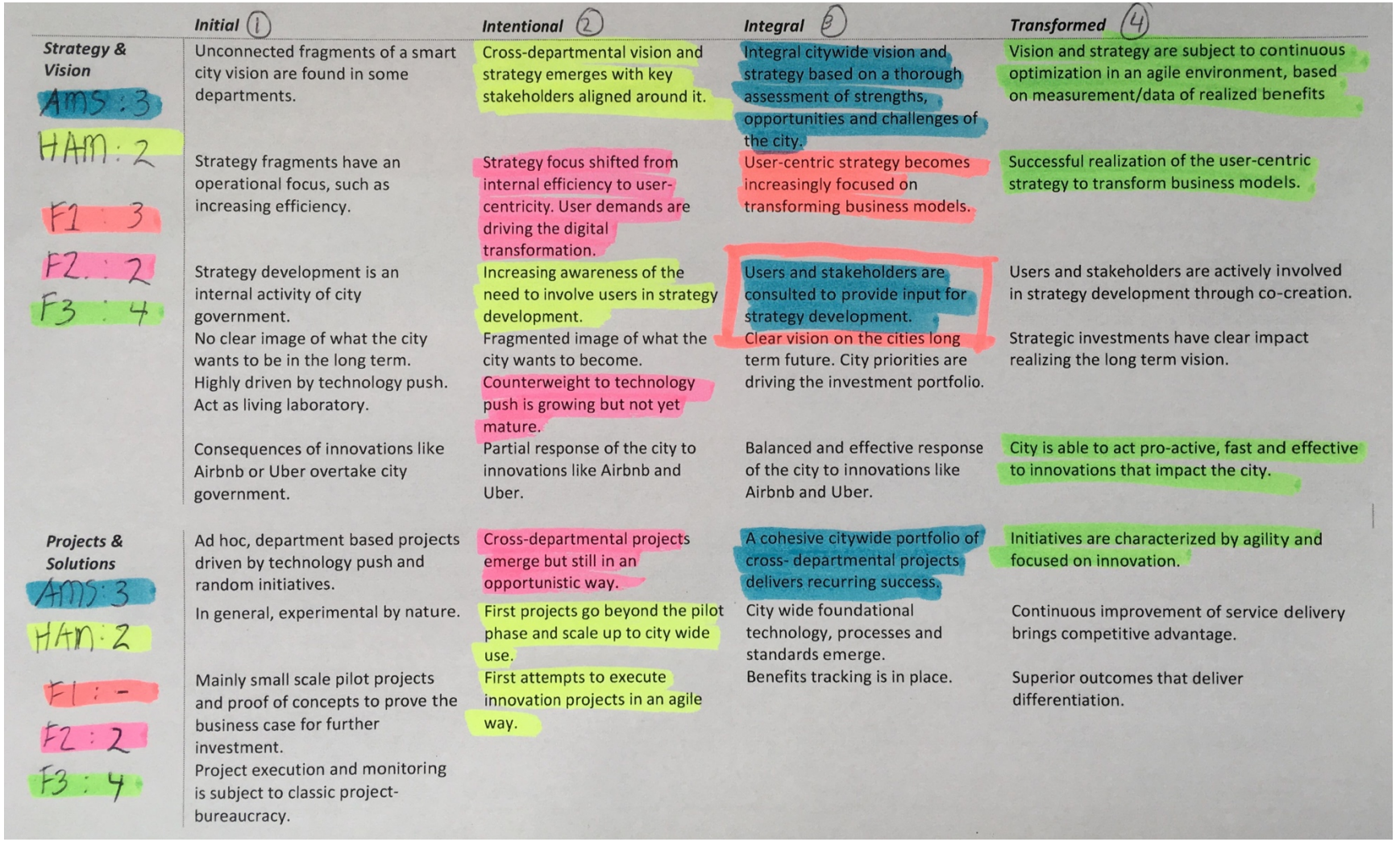
Consensus Statements -- Those That Do Not Distinguish Between ANY Pair of Factors.

All Listed Statements are Non-Significant at P>.01, and Those Flagged With an * are also Non-Significant at P>.05.

		Factors 1	2	3
No. Statement	No.	Q-SV Z-SCR	Q-SV Z-SCR	Q-SV Z-SCR
6 6 Social innovation	6	0 0.33	2 1.10	0 0.19
7* 7 Reliability	7	-2 -1.28	-3 -1.66	-2 -1.25
8* 8 Social innovation	8	0 0.30	1 0.94	1 0.37
9 9 Sustainability	9	-1 -1.11	0 -0.29	-1 -0.62
10* 10 Human dignity	10	2 0.98	2 1.10	2 1.25
11* 11 Service Quality	11	-2 -1.14	-1 -0.92	-2 -1.25
16 16 Secrecy	16	-2 -1.40	-1 -0.57	-3 -1.43
17 17 Sustainability	17	-1 -0.38	-2 -1.04	0 0.00
20 20 Sustainability	20	2 1.05	3 1.76	2 1.25
21* 21 Openness	21	1 0.44	0 0.00	1 0.62

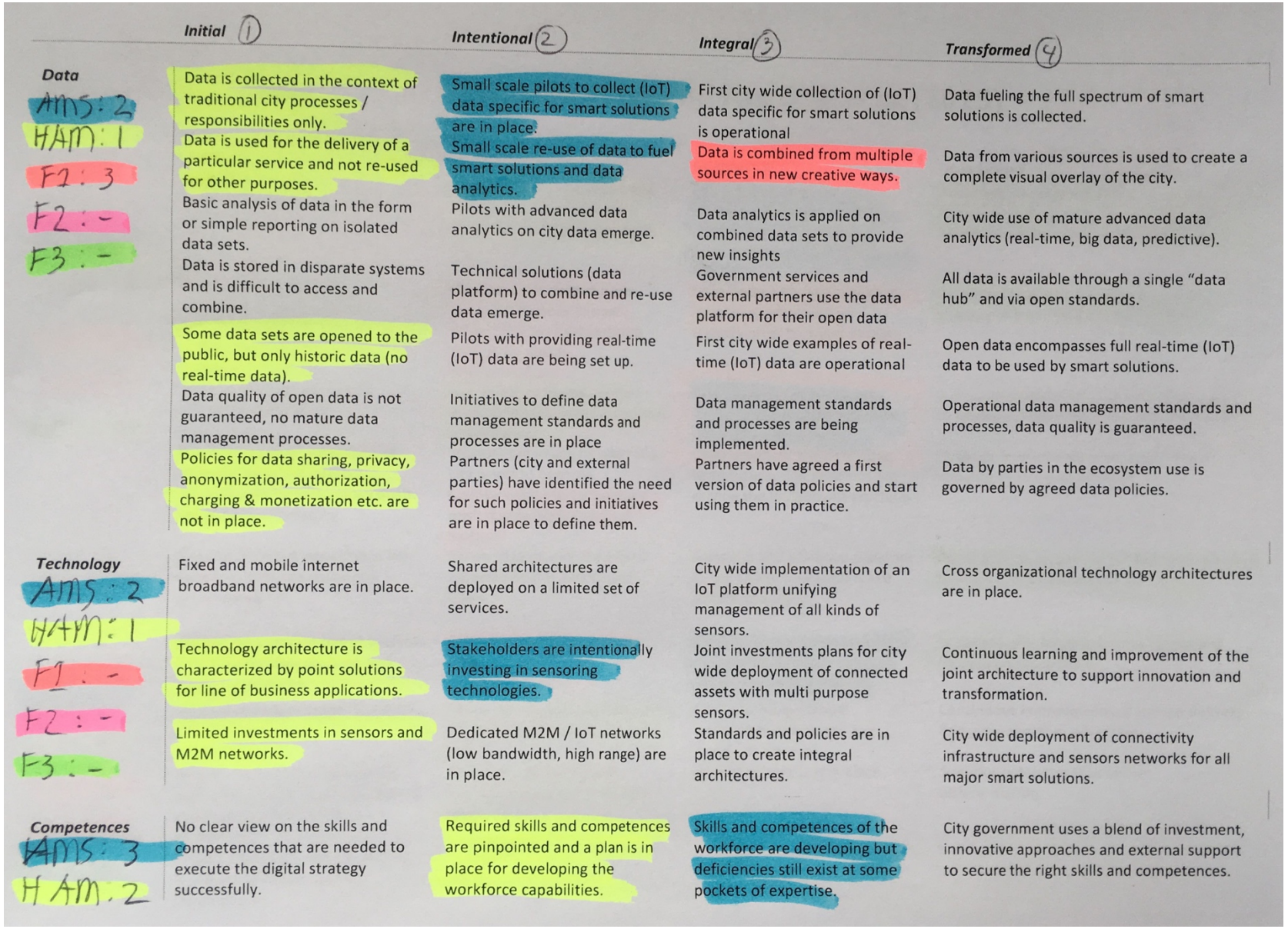
QANALYZE was completed at 12:59:02

Appendix VII. Interpretation Smart City development model



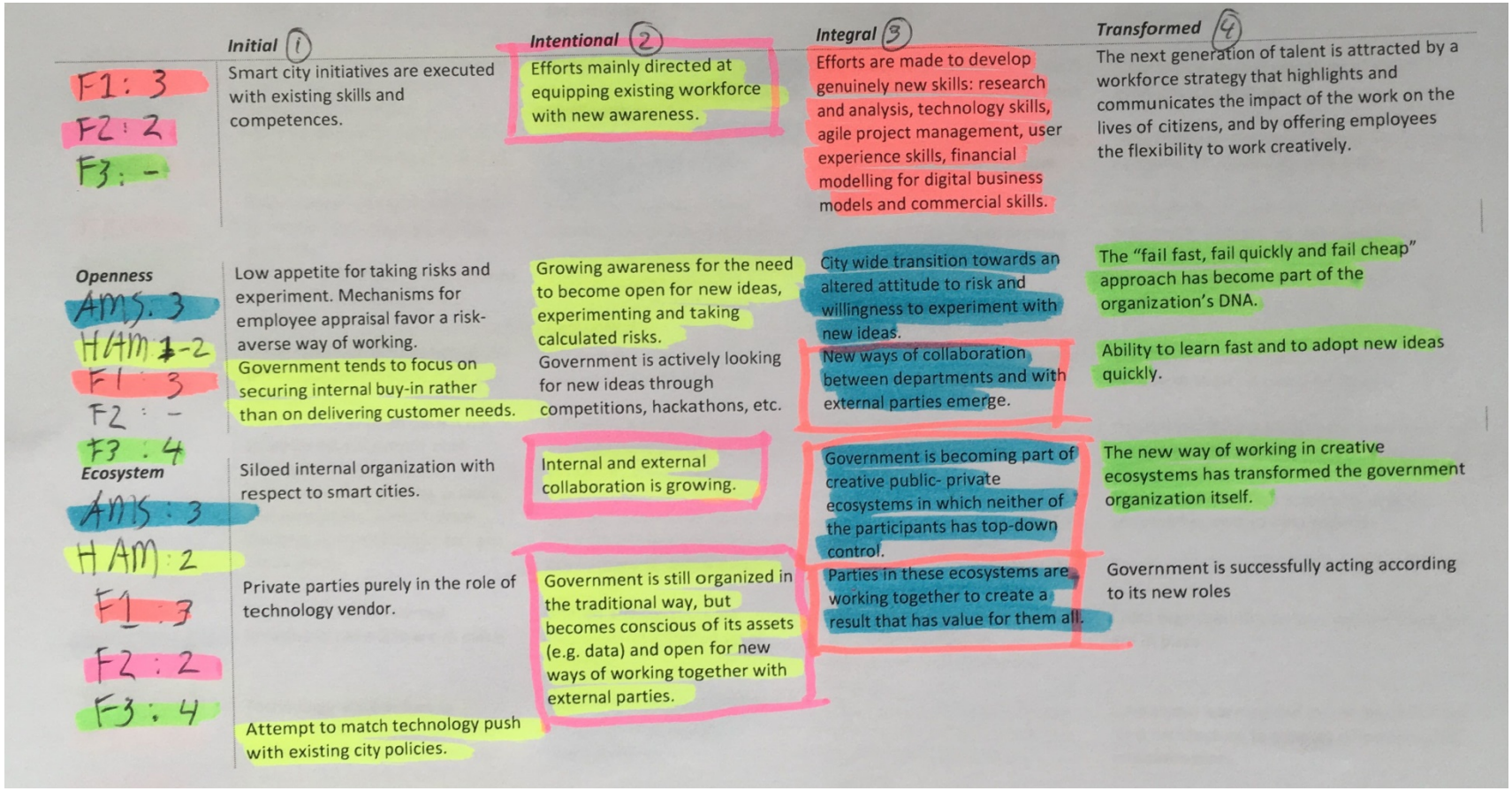
	Initial (1)	Intentional (2)	Integral (3)	Transformed (4)
Strategy & Vision AMS: 3 HAM: 2 F1: 3 F2: 2 F3: 4	Unconnected fragments of a smart city vision are found in some departments.	Cross-departmental vision and strategy emerges with key stakeholders aligned around it.	Integral citywide vision and strategy based on a thorough assessment of strengths, opportunities and challenges of the city.	Vision and strategy are subject to continuous optimization in an agile environment, based on measurement/data of realized benefits
	Strategy fragments have an operational focus, such as increasing efficiency.	Strategy focus shifted from internal efficiency to user-centricity. User demands are driving the digital transformation.	User-centric strategy becomes increasingly focused on transforming business models.	Successful realization of the user-centric strategy to transform business models.
	Strategy development is an internal activity of city government.	Increasing awareness of the need to involve users in strategy development.	Users and stakeholders are consulted to provide input for strategy development.	Users and stakeholders are actively involved in strategy development through co-creation.
	No clear image of what the city wants to be in the long term. Highly driven by technology push. Act as living laboratory.	Fragmented image of what the city wants to become. Counterweight to technology push is growing but not yet mature.	Clear vision on the cities long term future. City priorities are driving the investment portfolio.	Strategic investments have clear impact realizing the long term vision.
	Consequences of innovations like Airbnb or Uber overtake city government.	Partial response of the city to innovations like Airbnb and Uber.	Balanced and effective response of the city to innovations like Airbnb and Uber.	City is able to act pro-active, fast and effective to innovations that impact the city.
Projects & Solutions AMS: 3 HAM: 2 F1: - F2: 2 F3: 4	Ad hoc, department based projects driven by technology push and random initiatives.	Cross-departmental projects emerge but still in an opportunistic way.	A cohesive citywide portfolio of cross- departmental projects delivers recurring success.	Initiatives are characterized by agility and focused on innovation.
	In general, experimental by nature.	First projects go beyond the pilot phase and scale up to city wide use.	City wide foundational technology, processes and standards emerge. Benefits tracking is in place.	Continuous improvement of service delivery brings competitive advantage.
	Mainly small scale pilot projects and proof of concepts to prove the business case for further investment. Project execution and monitoring is subject to classic project-bureaucracy.	First attempts to execute innovation projects in an agile way.		Superior outcomes that deliver differentiation.

Figure 11.14 Interpretation Smart City development model for the cities and factors (1 of 3)



	Initial (1)	Intentional (2)	Integral (3)	Transformed (4)
Data	Data is collected in the context of traditional city processes / responsibilities only.	Small scale pilots to collect (IoT) data specific for smart solutions are in place.	First city wide collection of (IoT) data specific for smart solutions is operational	Data fueling the full spectrum of smart solutions is collected.
AMS: 2 HAM: 1 F1: 3 F2: - F3: -	Data is used for the delivery of a particular service and not re-used for other purposes.	Small scale re-use of data to fuel smart solutions and data analytics.	Data is combined from multiple sources in new creative ways.	Data from various sources is used to create a complete visual overlay of the city.
	Basic analysis of data in the form or simple reporting on isolated data sets.	Pilots with advanced data analytics on city data emerge.	Data analytics is applied on combined data sets to provide new insights	City wide use of mature advanced data analytics (real-time, big data, predictive).
	Data is stored in disparate systems and is difficult to access and combine.	Technical solutions (data platform) to combine and re-use data emerge.	Government services and external partners use the data platform for their open data	All data is available through a single "data hub" and via open standards.
	Some data sets are opened to the public, but only historic data (no real-time data).	Pilots with providing real-time (IoT) data are being set up.	First city wide examples of real-time (IoT) data are operational	Open data encompasses full real-time (IoT) data to be used by smart solutions.
	Data quality of open data is not guaranteed, no mature data management processes.	Initiatives to define data management standards and processes are in place	Data management standards and processes are being implemented.	Operational data management standards and processes, data quality is guaranteed.
	Policies for data sharing, privacy, anonymization, authorization, charging & monetization etc. are not in place.	Partners (city and external parties) have identified the need for such policies and initiatives are in place to define them.	Partners have agreed a first version of data policies and start using them in practice.	Data by parties in the ecosystem use is governed by agreed data policies.
Technology	Fixed and mobile internet broadband networks are in place.	Shared architectures are deployed on a limited set of services.	City wide implementation of an IoT platform unifying management of all kinds of sensors.	Cross organizational technology architectures are in place.
AMS: 2 HAM: 1 F1: - F2: - F3: -	Technology architecture is characterized by point solutions for line of business applications.	Stakeholders are intentionally investing in sensoring technologies.	Joint investments plans for city wide deployment of connected assets with multi purpose sensors.	Continuous learning and improvement of the joint architecture to support innovation and transformation.
	Limited investments in sensors and M2M networks.	Dedicated M2M / IoT networks (low bandwidth, high range) are in place.	Standards and policies are in place to create integral architectures.	City wide deployment of connectivity infrastructure and sensors networks for all major smart solutions.
Competences	No clear view on the skills and competences that are needed to execute the digital strategy successfully.	Required skills and competences are pinpointed and a plan is in place for developing the workforce capabilities.	Skills and competences of the workforce are developing but deficiencies still exist at some pockets of expertise.	City government uses a blend of investment, innovative approaches and external support to secure the right skills and competences.
AMS: 3 HAM: 2				

Figure 11.15 Interpretation Smart City development model for the cities and factors (2 of 3)



	Initial (1)	Intentional (2)	Integral (3)	Transformed (4)
F1: 3 F2: 2 F3: -	Smart city initiatives are executed with existing skills and competences.	Efforts mainly directed at equipping existing workforce with new awareness.	Efforts are made to develop genuinely new skills: research and analysis, technology skills, agile project management, user experience skills, financial modelling for digital business models and commercial skills.	The next generation of talent is attracted by a workforce strategy that highlights and communicates the impact of the work on the lives of citizens, and by offering employees the flexibility to work creatively.
Openness AMS: 3 HAM: 1-2 F1: 3 F2: - F3: 4	Low appetite for taking risks and experiment. Mechanisms for employee appraisal favor a risk-averse way of working. Government tends to focus on securing internal buy-in rather than on delivering customer needs.	Growing awareness for the need to become open for new ideas, experimenting and taking calculated risks. Government is actively looking for new ideas through competitions, hackathons, etc.	City wide transition towards an altered attitude to risk and willingness to experiment with new ideas. New ways of collaboration between departments and with external parties emerge.	The "fail fast, fail quickly and fail cheap" approach has become part of the organization's DNA. Ability to learn fast and to adopt new ideas quickly.
Ecosystem AMS: 3 HAM: 2 F1: 3 F2: 2 F3: 4	Siloed internal organization with respect to smart cities. Private parties purely in the role of technology vendor. Attempt to match technology push with existing city policies.	Internal and external collaboration is growing. Government is still organized in the traditional way, but becomes conscious of its assets (e.g. data) and open for new ways of working together with external parties.	Government is becoming part of creative public- private ecosystems in which neither of the participants has top-down control. Parties in these ecosystems are working together to create a result that has value for them all.	The new way of working in creative ecosystems has transformed the government organization itself. Government is successfully acting according to its new roles

Figure 11.16 Interpretation Smart City development model for the cities and factors (3 of 3)