

Organizational and managerial challenges for public actors working towards becoming a smart city

A case study of the City of Stockholm

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MASTER THESIS



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Stockholm, December 2017

Erika Björck and Filippa Österlin

Abstract

Cities are becoming smart to cope with the challenges associated with urban development. One of the cities trying to become smart is the City of Stockholm, which in 2017 adopted a strategy to become the world's smartest and most connected city. However, becoming a smart city is not easy. The transformation requires a new organizational approach and innovation in management, which the City of Stockholm must address to make the transformation successful.

The master's thesis was conducted through a case study of the City of Stockholm to investigate the organizational and managerial challenges of becoming a smart city, and the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city. Ten interviews and four observations were carried out through a cross-section of the City of Stockholm to understand the work towards becoming smart from different perspectives. The empirical data was combined with theoretical frameworks regarding smart city and innovation management to analyze the City of Stockholm's attempt to become a smart city.

The master's thesis identified twelve organizational and managerial challenges; *multiple and conflicting smart city definitions, lack of knowledge about the smart city strategy, lack of management support, unclear vision of the smart city strategy, insufficient involvement of employees, lack of alignment between the overall smart city goals and the initiated smart city projects, lack of structure for exchanging knowledge, lack of structure and routines for involving the citizens, high presence of functional silos and hierarchy, poor receptiveness of new ideas and resistance to change, lack of structure for liberating time and resources for new ideas and not embracing calculated risk.* Finally, the identified important critical success factors were; *management and organization, people and community and governance.* The City of Stockholm and similar public actors should take the findings into consideration to accelerate the smart city transformation.

Key words: smart city, innovation management, public actor

Sammanfattning

Städer vill bli smarta för att hantera utmaningar associerade med urban utveckling. En av de städer som försöker bli smart är Stockholms stad, som år 2017 formellt tog sig an en strategi om att bli världens smartaste och mest uppkopplade stad. Att bli en smart stad är dessvärre inte så lätt. Förvandlingen kräver ett nytt organisatoriskt angreppssätt och innovation av management, vilket Stockholms stad måste adressera för att uppnå en lyckad förvandling.

Examensarbetet har genomförts genom en fallstudie av Stockholms stad för att undersöka de organisatoriska och ledningsmässiga utmaningar för att bli en smart stad, och de viktiga kritiska framgångsfaktorerna för en offentlig aktör, som Stockholms stad, i hanteringen av att bli en smart stad. Tio intervjuer och fyra observationer genomfördes genom ett tvärsnitt av Stockholms stad för att förstå arbetet mot att bli smart från olika perspektiv. De empiriska data var kombinerad med teoretiska ramverk gällande smarta städer och innovationsmanagement för att analysera Stockholms stads försök att bli en smart stad.

Examensarbetet har identifierat tolv organisatoriska och ledningsmässiga utmaningar; *flera och motstridiga definitioner av en smart stad, brist på kunskap om smart stad-strategin, brist på support från ledningen, oklar vision av smart stad-strategin, otillräcklig involvering av anställda, brist på anpassning mellan de övergripande smart stad-målen och de initierade smart stad-projekten, brist på struktur för kunskapsutbyte, brist på struktur och rutiner för att involvera medborgare, hög närvaro av funktionella silos och hierarki, dålig mottaglighet av nya idéer och motstånd mot förändring, brist på struktur för befriande av tid och resurser för nya idéer och att inte omfamna beräknad risk.* Slutligen, identifierades viktiga kritiska framgångsfaktorer, vilka var; *management och organisation, människor och samhälle och styrning.* Stockholms stad och liknande offentliga aktörer bör ta hänsyn till resultaten för att påskynda förvandlingen till en smart stad.

Nyckelord: smart stad, innovationsmanagement, offentlig aktör

Vocabulary

| | |
|--------------------------|--|
| added value | An amount of value added to a product or service making it more compelling |
| ICT | Information and Communication Technology, referring to any kind of product or service able to store, transmit, receive or manipulate information digitally |
| innovation management | The management of innovation processes referring to product, business and organizational innovation |
| innovation process | The transformation process from idea to commercialized product, including the management and its phases |
| public actor | Governmentally owned organization, providing services to a city, operated by both its employees and democratically elected politicians |
| smart city | A city that makes a conscious effort to capitalize on ICT in a strategic way, seeking to achieve prosperity, effectiveness and competitiveness on multiple socio-economic levels |
| critical success factors | The limited number of areas in which satisfactory results will insure successful competitive performance |

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1 Introduction

This chapter introduces the background of the master's thesis and a discussion about the problem to be investigated. Additionally, the purpose and the delimitations are stated to give a clear scope. Finally, the thesis outline is given.

1.1 Background

1.1.1 Megatrends putting pressure on urban development

Globalization, digitization and urbanization are three worldwide megatrends radically altering the world (Kozlowski, 2012; Stockholms stad, 2017h). On one hand, these megatrends come with many challenges for cities (Angelidou, 2014) such as coping with excessive energy consumption, greenhouse gas emissions, waste management (Marceau, 2008), traffic congestions, scarcity of resources and human health concerns (Washburn et. al., 2010). On the other hand, urban development presents various opportunities to exploit (United Nations, 2015). First, globalization has accelerated notably during the last decades (EY, 2017). The phenomenon is complex and is reflected in society in multiple ways. People have increased their movement across borders and goods are transported at increased distances (Ortt, J. Smits, R. 2006). However, it is not only the physical transport of people and goods moving globally, but also the free movement of capital and information. For example, between 1980 and 2007, global capital flows increased by 25 times (Dobbs, Manyika and Woetzel, 2015). The enabling factors of these developments are trade liberalization and technological advancements, particularly in Information and Communication Technology (ICT) (Jakobsson, 2007).

Second, digitization is fundamentally changing our everyday life (Alm et. al., 2016). In 2016, more than six billion items were connected around the world, by 2020 the number of items is calculated to have increased more than three times over (Gartner, 2015). 5G, the next generation of mobile wireless systems, is expected to unlock the potential to connect and digitize another range of more sensitive applications. The vision of Internet of Things, as a hyper connected world where all physical items have a digital presence, is soon a reality (Le et. al., 2015). Third, the world is also becoming more urban. By 2050, two thirds of the

world's population is expected to live in cities and one third outside. This represents almost the opposite distribution compared to 100 years earlier, when one third lived in urban areas and two thirds on the countryside (United Nations, 2015). Evidently, it is critical to make this rapid growth of cities sustainable (Spence et. al., 2009), particularly because accelerated urbanization has a great impact on environmental, social and economic aspects (Zhang, 2016).

1.1.2 Cities are becoming smart to cope with the challenges associated with the megatrends

As a solution to the arising challenges derived from the megatrends, smart cities has become a buzzword (Angelidou, 2014). Many cities are trying to cope with the challenges by finding smarter ways of managing them (Chourabi et. al., 2012). However, besides the social and political challenges, making a city smart poses new organizational challenges for public actors (Nam and Pardo, 2011). The organizational challenges are many, from finding new ways to collaborate across borders to improved information sharing and integration (Gil-Garcia, 2012), which public actors need to address by employing new approaches (Nam and Pardo, 2011). In addition, there is not yet a unified definition of a smart city. Essentially, it is a city that makes a conscious effort to capitalize on ICT in a strategic way, seeking to achieve prosperity, effectiveness and competitiveness on multiple socio-economic levels (Angelidou, 2014). What is important is the human and social capital rather than completely relying on Information Technology per se (Hollands, 2008).

During the last decade various smart city projects have been initialized globally, but still there are no forerunners in the area. There are only examples of cities that have become smarter (Snow, Håkonsson, and Obel, 2016). In 2011, not a complete smart city was recorded, solely smart city projects within a city (Frost and Sullivan, 2013). So far, many of the world's smart city projects have been launched in Europe (Snow, Håkonsson and Obel, 2016). Snow, Håkonsson and Obel (2016) argue this is mainly due to the environmental requirements from the EU and its innovation partnership called *Smart cities and Communities Initiative*. The partnership was initiated in 2012 to encourage smart city projects in Europe (Snow, Håkonsson and Obel, 2016). One European city trying to become smart is the City of Stockholm (Stockholms stad, 2017d).

1.1.3 The City of Stockholm's vision to become the smartest and most connected city in the world by 2040

In 2017, the City of Stockholm adopted the *Strategy for a smart and connected city* which states that the City of Stockholm wants to become the smartest and most connected city in the world by 2040. The strategy for the City of Stockholm

has the potential to create value for the growing and changing city (Stockholms stad, 2017h). In fact, the city is growing at a fast pace, the fastest in Europe (Dagens Nyheter, 2015). The population is expected to increase with more than eleven percent between 2014 and 2020, which is in average of 50 people a day (Stockholms stad, 2017g). In addition, Sweden is ranked among the top ten most globalized countries in the world (KOF Swiss Economic Institute, 2017), inducing an increased international movement and communication to the capital (Stockholms stad, 2017h). The Swedish industry being globally based (Goude and Öberg, 2015) and with Internet's continuing expansion, companies and customers are finding more ways of communicating (Larsson and Viitaoja, 2017). The City of Stockholm is taking on an active role in transforming Sweden into a digital forerunner; the capital enjoys the world's largest open fiber network (Stockholms stad, 2017h) and a 100 percent broadband coverage (Stokab, 2014). By taking advantage of these conditions, the City of Stockholm aims to make the life easier and better for its citizens and visitors (Stockholms stad, 2017).

A smart city, according to the City of Stockholm, is one that uses new technology to connect, simplify and improve the everyday life of the citizens and its visitors. In the strategy, all departments in the organization are included and will work collectively towards the goal to avoid solutions being implemented in functional silos. Consequently, collaboration is critical for the implementation of the strategy, both internally within the City of Stockholm and externally with citizens, other public actors, businesses and academia. The vision to become a smart city will be achieved through innovative solutions, openness and connectivity where new technology will act as an enabler (Stockholms stad, 2017h).

1.1.4 The urge of managing for innovativeness in the transformation towards becoming a smart city

Once a city has decided to become smart, the city must understand its needs and what innovation opportunities to exploit. In a smart city, it is necessary for the city administrators to have extensive coordination across functions and continuously demonstrating the financial benefits of becoming smart. However, changing the status quo for city managers is a difficult task. The transformation will require innovation in many areas: from planning, management to operations (Naphade et. al., 2011). Research shows that the problem of successfully implementing new innovations is not in the generation of new and innovative ideas, but in the management of innovation (Kemp et. al., 2003; Van der Panne, van Beers and Kleinknecht, 2003). However, innovation in a smart city is not only about the implementation of advanced technological platforms, but rather about harnessing the creativity and intelligence of the citizens (Neirotti et. al., 2014). Involving citizens do not only result in effective decision-making but also leads to governments and communities becoming more sustainable (Coe, Paquet and Roy, 2001).

1.2 Problem discussion

The City of Stockholm is confronted with many challenges due to the evolving megatrends affecting the city. In order to maintain a sustainable urban development, the City of Stockholm needs to find new smarter ways of managing it. As a result, the City of Stockholm has introduced a strategy with a vision to become the smartest and most connected city in the world by 2040. However, there are many challenges public actors face when trying to transform into a smart city (Monzon, 2015). Reaching this vision implies managing innovative solutions, connectivity and openness, both internally within the City of Stockholm as well as externally towards citizens, businesses and academia. However, transforming organizations is difficult, because change and management are two complex matters (Sirkin, Keenan and Jackson, 2005). For the City of Stockholm to transform into a smart city: cross-functionality, management support, communication, and many other organizational and managerial matters are required (Stockholms stad, 2017h). To succeed with this sort of change, innovation in management is necessary for future competitiveness (Hamel, 2006), and in the City of Stockholm's vision to become the world's smartest and connected city.

However, there is little research regarding innovation management in the public sector (Wihlman et. al., 2016) as well as for smart cities (Nam and Pardo, 2011). In addition, the research about how to make a city smart is limited. There is also little research about how managerial and organizational issues are addressed for smart city initiatives (Chourabi et. al., 2012). Therefore, the problem investigated in the master's thesis was to identify the organizational and managerial challenges of becoming a smart city and the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city.

1.3 Purpose

The purpose of this master's thesis is to contribute both to academia and to practice. The contribution to academia will be in terms of identifying the organizational and managerial challenges for a public actor working towards becoming smart and the important critical success factors in managing towards a smart city. Regarding practice, the contribution is an understanding of the organizational and managerial challenges as well as the important critical success factors for the City of Stockholm to become a smart city.

1.3.1 Research questions

In order to investigate the problem discussed above the following research questions were examined.

Research question 1: What are the organizational and managerial challenges of becoming a smart city?

Research question 2: Which are the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city?

1.4 Delimitations

The master's thesis was carried out at the Faculty of Engineering at Lund University. The time limitation was set to 20 weeks why the scope of the thesis is adjusted thereafter. The scope was limited to the organizational and managerial challenges a public actor is facing when trying to become a smart city as well as the important critical success factors for a public actor in managing towards a smart city. The organizational and managerial challenges the City of Stockholm faces were identified with inspiration from organizational routines in innovation management and the challenges derived from smart city theory. Thus, the focus was not on innovation management per se, but rather the challenges in innovation management required considering in the work towards becoming a smart city. In the master's thesis, a public actor refers to the governmental organization responsible for the city's services.

The master's thesis was delimited to the City of Stockholm as a public actor rather than focusing on the physical city. The master's thesis was conducted through a case study based on a cross-section of the City of Stockholm to get a deeper understanding of the city's work towards becoming smart. The cross-section of the City of Stockholm involved both employees working with smart cities on different levels in the organization and to different extents as well as employees not involved. In particular, employees from the Traffic Administration, a department at the City of Stockholm, represented a majority of the cross-section. Any generalization of the master's thesis should be conducted with consideration to the delimitations.

1.5 Target group

The master's thesis was mainly addressed to employees and managers at the City of Stockholm with the aim of providing an understanding of the organizational and

managerial challenges the City of Stockholm is facing and its important critical success factors when transforming into a smart city. In addition, the master's thesis aimed at addressing students and teachers with an interest in organizational routines in innovation management and smart cities.

1.6 Thesis outline

Chapter 1 Introduction

This chapter introduces the background of the master's thesis and a discussion about the problem to be investigated. Additionally, the purpose and the delimitations are stated to give a clear scope. Finally, the thesis outline is given.

Chapter 2 The City of Stockholm

This chapter provides an understanding of the City of Stockholm as an organization as well as the strategy adopted to become the world's smartest and most connected city.

Chapter 3 Methodology

This chapter gives an explanation of the methodology applied to carry out the master's thesis. It first describes the overall research approach and then the data collection methods are explained in detail, which involves both a case study and a literature review. Thereafter information about the data analysis is given. Later, the methodology is summarized and the work process in total described. Ultimately, the trustworthiness of study is discussed.

Chapter 4 Theory

This chapter focuses on the relevant theory intended to give the reader a comprehensive understanding of the literature review conducted. The theoretical framework presents existing literature and research on smart cities and innovation management. Ultimately, a summarized theoretical framework is given.

Chapter 5 Empirical data

This chapter presents empirical data gathered through observations and interviews at the City of Stockholm to understand the smart city work carried out and the organizational routines in innovation management.

Chapter 6 Analysis

This chapter presents the analysis of the theory and the empirical data. It first discusses the organizational and managerial challenges and ultimately, the critical success factors for the City of Stockholm in managing towards a smart city.

Chapter 7 Conclusions

This chapter presents the conclusions of the master's thesis by answering the research questions. Contributions to academia and to practice are also given as well as further reflections and recommendations. Ultimately, suggestions for future research are presented.

2 The City of Stockholm

This chapter provides an understanding of the City of Stockholm as an organization as well as the strategy adopted to become the world's smartest and most connected city.

2.1 The organization

The City of Stockholm is a governmentally owned organization providing services in the capital of Sweden (Stockholms stad, 2017a), operated by both its employees and democratically elected politicians (Stockholms stad, 2017b). The City of Stockholm constitutes a large corporation with 40 000 employees (Stockholms stad, 2017a) widely spread throughout different administrations and subsidiaries responsible for education, sports, environment, libraries, traffic management and city planning (Stockholms stad, 2015).

The City Council is the City of Stockholm's highest governing body and it is run by a 101 democratically elected politicians, see the organizational chart in Figure 2.1. The City Executive Board is the link between the politicians and the employees, and has the overall responsibility to execute, follow up and evaluate the decisions of the City Council. The City Executive Board also gives their opinions in all matters to the City Council (Stockholms stad, 2014). The City Executive Office helps the board to execute the directives from the politicians to the organization's 14 district councils and 15 specialist administrations. The Traffic Administration is one of the 15 specialist administrations and its task is to make public spaces and the traffic safe, clean and easy to navigate for the citizens (Stockholms stad, 2017j).

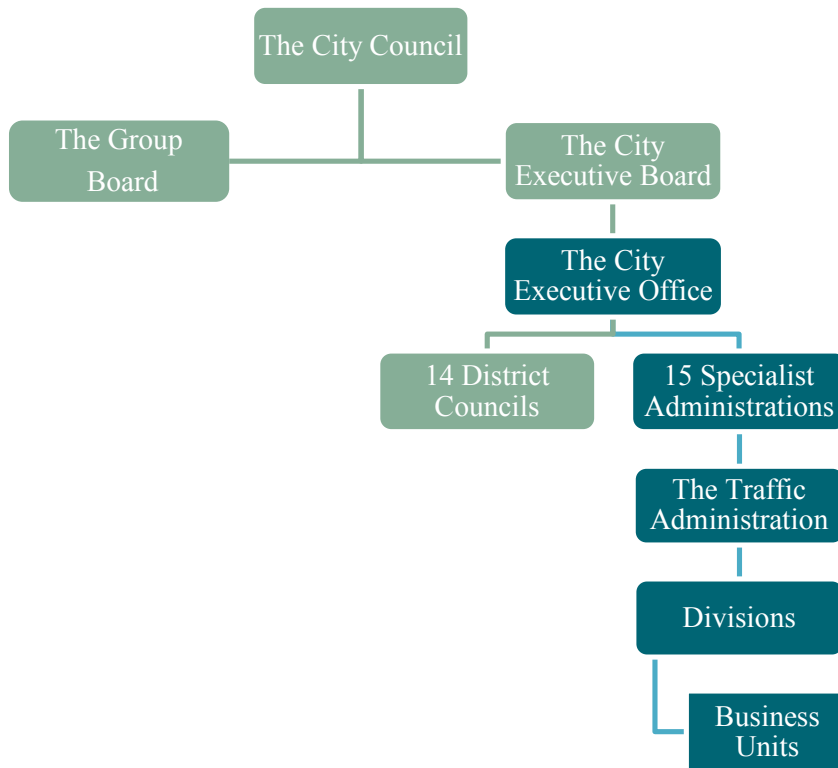


Figure 2.1 shows the organizational chart of the City of Stockholm highlighting the City Executive Office and the Traffic Administration (Stockholms stad, 2015; Stockholms stad, 2017b, Stockholms stad, 2014).

2.2 The strategy to become a smart city

In April 2017, the City Council formally adopted the strategy for the City of Stockholm to become the smartest and most connected city in the world by 2040 (Stockholms stad, 2017g). In a formal document the vision is presented as well as the strategy to accomplish it. The document is comprised by various themes including major macro trends and the components of the strategy, including the vision and the principles for enabling and implementing the strategy (Stockholms stad, 2017h). The development of the adopted strategy was led by the City Executive Office and involved many parts of the City of Stockholm, the private sector, universities and citizens. The citizens' opinions and perspectives were included through interviews, workshops with focus groups and a survey with over 3000 responses (Palm, 2017).

2.2.1 The vision

The vision to become the smartest and most connected city in the world consists of several parts; a core, four surrounding principles and three approaches, see Figure 2.2 below.

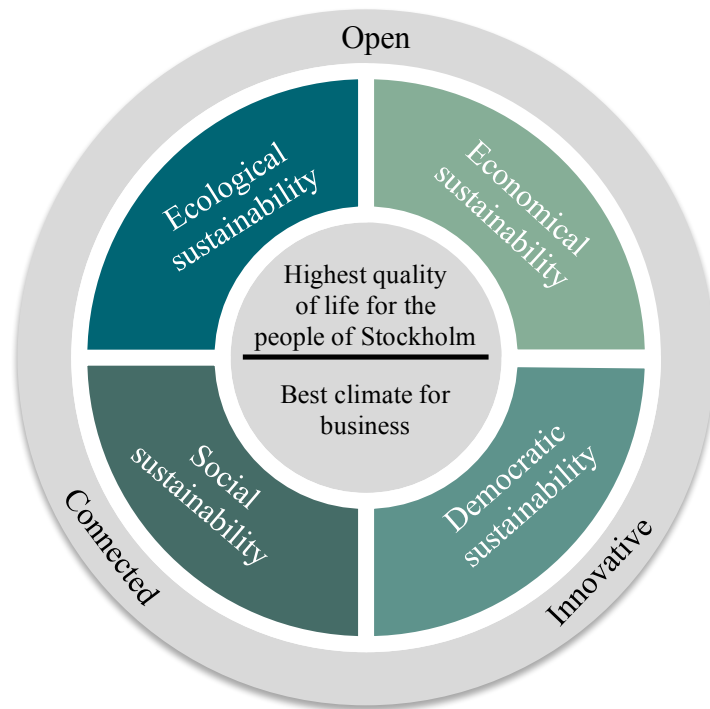


Figure 2.2 shows the City of Stockholm's vision to become the smartest and most connected city in the world (Stockholms stad, 2017h). Authors' own figure inspired by Stockholms stad (2017h).

The core of the vision is to provide the highest quality of life for the citizens and deliver the best climate for businesses to flourish. This will be achieved in concurrence with the four principles: ecologically sustainable, financially sustainable, socially sustainable and democratically sustainable (Palm, 2017). In the smart city, new smart services are created continuously to make the city more innovative, which is enabled by connectivity, open data, integrated platforms, sensors and other technology. Some of the City of Stockholm's existing pre-conditions are listed below.

- The citizen's high digital maturity, the city's developed fiber optic network and first in the world to implement 4G,
- Accessible open data to the public,

- High level of equality and flat hierarchies where each person's ideas are respected (Stockholm stad, 2017h),
- Top ranked climate for start-ups and the second highest amount of technical companies per capita in the world (Atomico, 2014).
- One of Europe's most environmentally friendly cities and was the first to be awarded The European Green Capital in 2010 (European Commission, n.a.).

As of today, the City of Stockholm has not defined any performance measurement to indicate the level of smartness the city has reached or how to evaluate which city is the smartest. However, the strategy states that measurements will be developed to evaluate the performance of the smart city initiative (Stockholms stad, 2017h).

2.2.2 Enabling and implementing the strategy

In the strategy, a number of actions to enable and implement the strategy are declared as necessary for the City of Stockholm to reach its goal in becoming smart. The enablers concern the operation, technology and cost allocation principles. For example, these enablers suggest employees must adopt the strategy in the management of their operations, develop appropriate forums to engage with citizens and create a culture that promotes innovation and cooperation. The actions to implement the strategy regard coordination and cooperation, communication and prioritized projects. For example, each business is responsible for communicating their ongoing projects and a set of prioritized projects will be selected in accordance to certain criteria, which must be in line with the vision (Stockholms stad, 2017h).

3 Methodology

This chapter gives an explanation of the methodology applied to carry out the master's thesis. It first describes the overall research approach and then the data collection methods are explained in detail, which involves both a case study and a literature review. Thereafter information about the data analysis is given. Later, the methodology is summarized and the work process in total described. Ultimately, the trustworthiness of study is discussed.

3.1 Research approach

In general, a methodology is the approach chosen to conduct research (Jonker, 2009). A methodology comprises certain steps of methods and techniques, such as data generation, data collection, data classification and data analysis, which all result in a research design (Jonker, 2009; Creswell, 2014). The approach to research can either be qualitative, quantitative or a mixed method. A mixed method, as the name reveals, applies a mix of both qualitative and quantitative approaches. Qualitative research is used to build an in-depth understanding, whereas the quantitative approach is used to test theories when the subject or problem is known. The purpose of the study should guide which approach to apply (Creswell, 2014). Four types of research purpose are applicable: exploratory, descriptive, explanatory and evaluative (Salkind, 2010).

The purpose of the master's thesis was to get an in-depth understanding of both the organizational and managerial challenges and the important critical success factors a public actor faces in its smart city transformation. However, there is a lack of prior research and knowledge in the subject. Therefore, the type of research purpose in the master's thesis will be exploratory. This type is applicable when there is little knowledge in the subject and the goal is to investigate whether there are connections among the investigated variables or not (Salkind, 2010). However, the research purpose was also evaluative, since theoretical frameworks were used to assess the City of Stockholm's organizational and managerial challenges and to evaluate the critical success factors. An evaluative research purpose is used when attempting to evaluate an event, process or procedure (Salkind, 2010). Finally, to build the in-depth understanding, the research approach of the master's thesis was chosen to be qualitative.

3.1.1 Research design

The research design describes the sequence of methods applied to answer the research questions (Salkind, 2010). The research design can be described as the interaction of three building blocks: theory, methodology and the research question, shown in Figure 3.1. As knowledge is acquired during research, the interactions among the three building blocks become more distinct, gradually outlining the research design (Jonker, 2009).

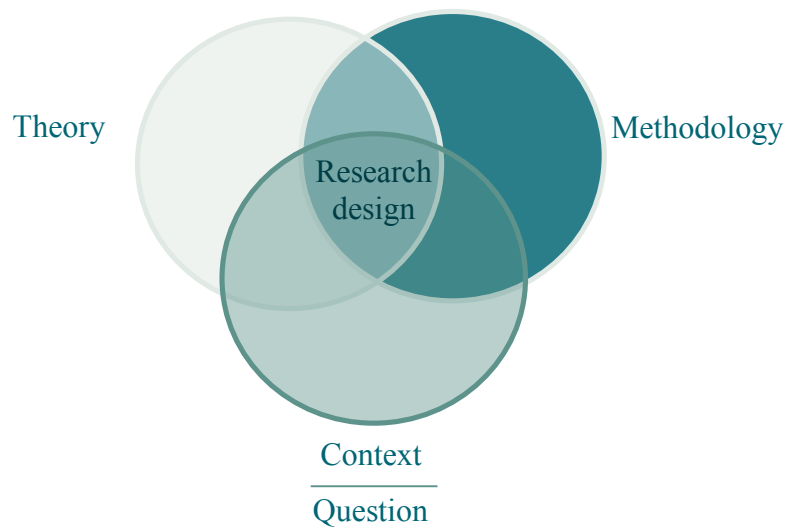


Figure 3.1 shows the building blocks of the research design. Authors' own figure inspired by Jonker (2009).

In qualitative research there are a number of applicable designs (Creswell, 2014). Creswell (2014) describes five common ones; narrative research, phenomenological research, grounded theory, ethnography and case studies. The case study design is justified when there is a lack of prior research and formulations of valid hypotheses (Mills, Durepos and Wiebe, 2010). Furthermore, the case study is beneficial to apply when conducting an in-depth analysis (Creswell, 2014) and is especially applicable when the investigation regards a real-life phenomenon (Farquhar, 2012). Therefore, a case study of qualitative character was conducted in the master's thesis to get a deeper understanding of the organizational and managerial challenges a public actor faces whilst trying to become a smart city and which the important critical success factors are. The case study will focus on the City of Stockholm's attempt to become smart which is a real-life phenomenon and requires an in-depth analysis to understand. In addition, the chosen design is justified since, as stated in the previous section, Section 3.1, there is a little previous research and formulated hypotheses in the subject.

3.1.2 Case study

In a qualitative case study a particular phenomenon or situation is investigated. Qualitative case studies have four characteristics in common. They are particularistic, descriptive, heuristic and inductive. A case study is particularistic because it concentrates on a specific matter and it is descriptive because the phenomenon investigated is described in a holistic matter. Additionally, a case study is heuristic because it can give the reader new perspectives about the phenomenon studied and it is inductive because it is mostly based on inductive argumentation, which means that concepts and hypothesis appear from the information studied (Merriam, 1988/1994).

3.1.2.1 Designing the case study

According to Yin (2012), there are three steps to designing the case study:

1. Defining the case
2. Using single or multiple cases
3. Deciding whether to use a literature review about methodology

The first step is to define which case will be the main unit of analysis. Keeping the original definition throughout the research is often beneficial since the developed research questions or reviewed theory will be connected to it. However, redefining the case is a possibility if the initial data collection supports it (Yin, 2012). As a starting point, the case study was aimed at investigating how the City of Stockholm applied innovation in their work to become smart, since it appeared in literature that a transformation of this kind required innovation in many areas. However, from further investigations in the subject, it became evident that the problem in implementing new innovations was not in the generation of new ideas but in the management of innovation. Therefore, the case study in the master's thesis was defined as the City of Stockholm's work towards becoming a smart city by understanding its organizational and managerial challenges and its important critical success factors, subjects that lacks prior research.

The second step involves deciding whether the case study consists of single or multiple cases and if it has embedded units or holistic. The different combination of options can be seen in Figure 3.2. If the defined case has units that exist in several different contexts, the case study will include multiple cases (Yin, 2012). For instance, if the study will focus on multiple organizations, each of the organization abides to different contexts. The research can also be of several units within the same context, and then the units are described as embedded (Farquhar, 2012). Otherwise the case study is called holistic (Yin, 2012). Firstly, the case study in the master's thesis was a single-case design, since the context remained the same, the City of Stockholm. Secondly, the case study was embedded since the City of Stockholm's work towards becoming a smart city was based on a cross-section of the organization, inducing multiple units were analyzed. The units

represented various levels of the organization to gather different perspectives from top to bottom, from the Executive office to the Traffic Administration and its business units.

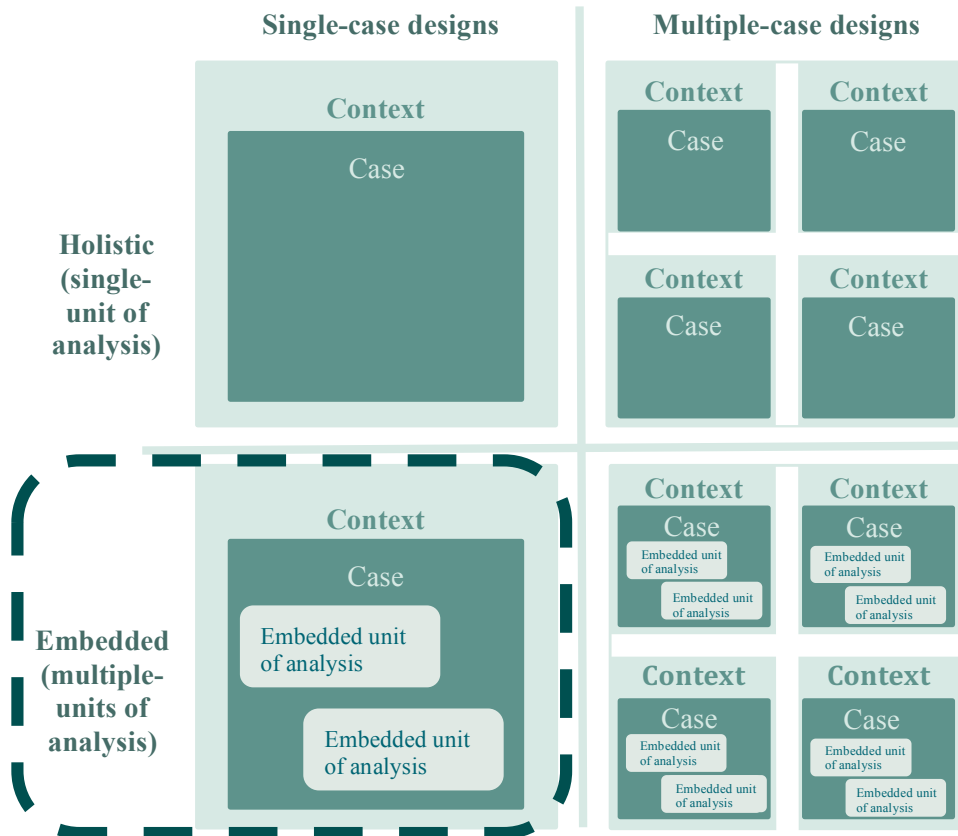


Figure 3.2 shows the different types of case study designs (Yin, 2012) and the type chosen in this case study. Authors' own design inspired by Yin (2012).

As a third step in designing the case study, it was decided to carry out a complementary literature review about methodology to support the case study design. Furthermore, theory can act as guidance in the fundamental stages of the methodology, such as developing research questions and settling on a case study design. The existing theoretical perspective can help the researcher categorize and group initial empirical data. However, researchers have to be aware that it can also influence the perspective of the researchers and limit the ability to discover and link evidence in new manners (Yin, 2012). A literature review about the methodology was conducted and showed to be beneficial for understanding the methodology applied in the master's thesis. For example, it was beneficial to know how to conduct a case study in terms of scope and choosing appropriate data collection methods. However, caution was taken not to allow literature to limit the perspective.

3.2 Data collection

After settling the research design, the next step is to decide methods of data collection (Vogt, 2010).

3.2.1 Literature review for the theoretical framework

A literature review is an important step when conducting research. Being familiar with previous research and theories within the research area can help when defining concepts, planning the empirical data collection and analyzing the results from the research. Above that, previous research can help delimiting and formulating the problem being studied (Merriam, 1988/1994). Furthermore, the literature review can be used to refine the research question and to find the gap in theory (Farquhar, 2012).

The literature review was carried out through an iterative process where theory was complemented gradually. In particular, two areas constituted the literature search: smart city and innovation management. The literature review was composed by several types of sources; books, e-books, academic journals, websites, press releases, material published by acknowledged consultancy firms, etcetera. To orientate among the extensive amount of materials, relevant keywords were used. Especially LUBsearch, a search engine for employees and students at Lund University (Lund University, 2017) was used to find materials and build the theoretical framework. A review of the number of published materials per year regarding smart cities and smart city was conducted in LUBsearch. Additionally, organizational routines to successful innovation management and critical success factors to a smart city initiative were reviewed. First, the collected theory about innovation management and smart cities was summarized into one theoretical framework. In the theoretical framework, specific organizational routines in innovation management and challenges a public actor faces derived from smart city theory, were summarized. Next, an additional framework was used to evaluate and identify the important critical success factors. Finally, the literature review was used to determine the scope for the empirical data collection and to structure the data.

3.2.2 Methods to gather empirical data

There are several methods to gather empirical data when conducting a case study. Yin (2012) describes six common ways listed below.

1. Direct observations (e.g. human actions)
2. Interviews (e.g. open-end conversations with key participants)
3. Archival records (e.g. student records)

4. Documents (e.g. newspaper articles)
5. Participant-observation (e.g. being identified as a researcher but also filling a real life role into the scene being studied)
6. Physical artifacts (e.g. computer downloads of employees' work) (Yin, 2012).

Qualitative case studies are to a large extent based on qualitative information gathered from interviews, observations and documents of different varieties (Merriam, 1988/1994). The method to gather empirical data in the master's thesis was through interviews and observations since the purpose of the master's thesis was to get an in-depth understanding of the City of Stockholm's work towards becoming a smart city. Therefore, through the cross-section of the City of Stockholm, interviews and observations with employees at various levels were conducted to gather different perspectives.

3.2.3 Interviews

The main purpose of an interview is to obtain certain information from an individual about the case being studied. This approach is useful when it is not possible to observe the interviewee's feelings or an event that has already passed (Merriam, 1988/1994).

3.2.3.1 Interview approach

The most common way to decide what sort of interview to conduct is by considering the level of structure wanted. In the master's thesis a semi-structured approach was chosen, since it gives the interviewer a greater flexibility, and the interviewee a chance to elaborate on specific topics (Magnusson and Marecek, 2015). Furthermore, less structured interviews are more common when dealing with qualitative case studies (Merriam, 1988/1994). In a semi-structured interview the questions are predetermined in an interview guide, but if the conversation encourages a different order of topics, the researcher is free to adapt to the change (Magnusson and Marecek, 2015). Additionally, an interview guide was used to guarantee all interviewees answered the same questions, which facilitated comparison, but still gave the researchers the freedom to go in-depth.

3.2.3.2 Designing the interview guide

Hancock and Algozzine (2017) argue that an interview guide should be developed with appropriate open-ended questions. Questions of this type do not have a predetermined structure to the answers, but should be an invitation for the interviewee to give further information (Magnusson and Marecek, 2015). By using an interview guide the comparability is increased and the completeness of data for each interviewee is enhanced. However, there is little flexibility in adjusting each interview to specific individuals (Hancock and Algozzine, 2017). Preparing the

interview guide is an iterative process with several drafts (Magnusson and Marecek, 2015). According to Yin (2012) a pilot test can assure the data collection method is being well targeted. For these reasons, an interview guide with open-ended questions was developed. The process of developing the interview guide was iterative; see the process in Figure 3.3. Through the iterative process, open-ended questions were developed, then feedback was received, interviewees were recruited, a pilot interview was conducted to evaluate the interview guide's adequateness and adjustments in the interview guide were made. The interview guide can be found in Appendix A.

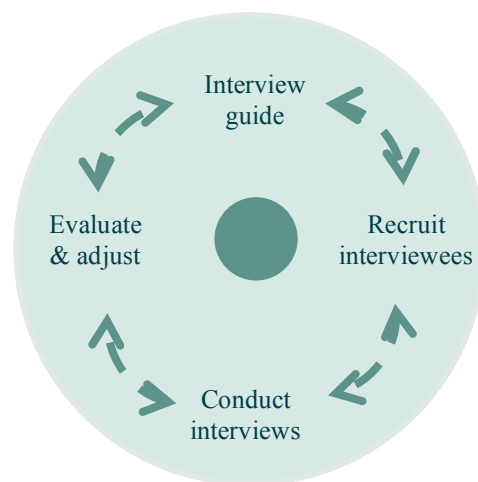


Figure 3.3 shows the iterative process of designing the interview guide used for the master's thesis. Authors' own figure inspired by Hennink, Hutter and Bailey (2011).

3.2.3.3 Sampling of the interviewees

In a qualitative case study the researcher must determine which participants, situations and phases to include to best study the decided phenomenon, since it is neither possible to interview everyone nor to study every part of a phenomenon. For this reason, a sampling method needs to be chosen (Merriam, 1988/1994). There are three main methods to sampling in qualitative research: convenience, judgment and theoretical sampling. The method of theoretical sampling was chosen in the master's thesis since it takes advantage of data collected early from the literature review and from observations. This will allow the sample to evolve through an iterative process. The chosen sampling method was also expected to generate a better understanding of the City of Stockholm's work towards becoming a smart city and its routines in innovation management (Marshall, 1996). Identifying and securing key personas to interview (Hancock and Algozzine, 2017) and determining the appropriate sample size to adequately answer the research questions are crucial processes in the case study. The necessary size of the sample often becomes clear during the research process. Therefore, it is critical that the design of the case study is flexible and iterative

(Marshall, 1996). In the master’s thesis, Björn Lindelöf, an employee at the City of Stockholm helped identify and gain access to employees corresponding to the cross-section of the organization.

The final sample consisted of thirteen interviewees. As a cross-section of the City of Stockholm formed the basis of the empirical data to understand the city’s work towards becoming a smart city, the sample represented both employees as well as managers from different places of employments in the organization, in particular from the Traffic Administration and its business units as well as from the City Executive Office. To understand the city’s work towards becoming a smart city, employees and managers with different levels of involvement in the subject were chosen. The involvement in the smart city work was divided into fully involved, partly involved and not involved, dependent on if the interviewee worked daily with making the city smart or did not work actively towards the goal. The interviewees were chosen iteratively to achieve an appropriate sample size and a representative cross-section of the City of Stockholm. The method to get in contact with the interviewees was by email. If they had not responded in approximately a week they were contacted again by email or by phone, until a final answer was given. The expected outcome was that all interviewees would participate in an interview. However, only ten out of 13 interviewees participated, see Table 3.1.

Table 3.1 lists the interviewees, the place of employment in the organization, their position and their level of involvement in the smart city work at the City of Stockholm.

| Interviewee | Place of employment in the City of Stockholm | Position | Involvement in smart city work |
|-------------|--|----------|--------------------------------|
| 1 | Traffic Administration | Manager | Fully involved |
| 2 | Traffic Administration | Employee | Fully involved |
| 3 | Traffic Administration | Employee | Fully involved |
| 4 | Traffic Administration | Manager | Not involved |
| 5 | Subsidiary | Manager | Fully involved |
| 6 | The Executive Office | Manager | Fully involved |
| 7 | The Executive Office | Employee | Fully involved |
| 8 | Traffic Administration | Employee | Partly involved |
| 9 | Traffic Administration | Manager | Fully involved |
| 10 | Traffic Administration | Employee | Not involved |

3.2.3.4 Managing interviews

There are three techniques for managing empirical data gathered through interviews. The typical method is through an audio recording of the interview to guarantee a total cover-up of the interview (Merriam, 1988/1994), which then can be transformed into written data by transcription (Dul and Hak, 2008). When collecting data through audio record, Magnusson and Marecek (2015) claim verbatim transcription is a must in qualitative research to adequately analyze the

data. Therefore, audio recording was applied to cover the material produced during the interviews, followed by verbatim transcription.

3.2.4 Observations

Observation as a data collection method involves the systematic and detailed recording and examination of behavior and talk. The advantage of observing people in a natural habitat is that it overcomes the difference of what people say and what they actually do (Mays & Pope, 1995). The interaction between the observer and the observed can be of four different characters: full participant, participant-observer, observer-participant and full observer (Merriam, 1988/1994). The observations in the master's thesis were conducted through an observer-participation character, since the participants in the observations were aware of the researchers, but the researcher did not take part in discussions. This approach is appropriate when the observer is more of an observer than member of the observed group, but the group knows about the observer's role (Merriam, 1988/1994). This approach was chosen to gain access to meetings and workshops at the City of Stockholm and to understand its work towards becoming a smart city, but still have a minimal impact on the outcome. The method to collect data from the observations was through an iterative process; finding targets to observe, conduct observation and write down reflections, see Figure 3.4.

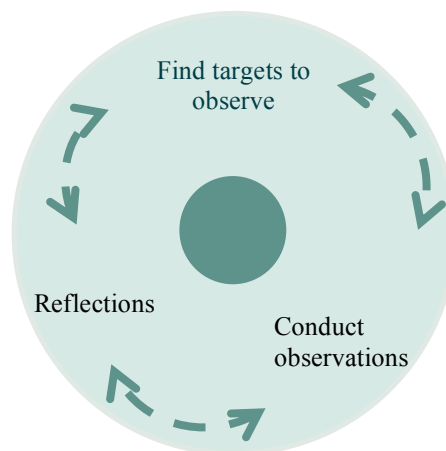


Figure 3.4 shows the iterative process of conducting observations.

3.2.4.1 Sampling of the observations

Similarly to the interviews, a theoretical sampling was chosen for the observations, see Section 3.2.3.3 for further information about the sampling method. The final sample consisted of four observations, see Table 3.2 below, which were accessed through invitations from Björn Lindelöf and selected by the topic and its

adequateness to gather empirical data as a complement to the interviews carried out.

Table 3.2 lists the observations, the type of gathering, its purpose and the participants.

| Observation | Type of gathering | Purpose | Participants |
|-------------|-------------------|--|---|
| 1 | Workshop | To homogenize knowledge about smart city technology in the group | Employees and managers from the Traffic Administration |
| 2 | Meeting | To discuss and develop the next step in the innovation process of a project regarding smart street lighting. | Employees from the Traffic Administration and a consultant |
| 3 | Workshop | Involve a business unit at the Traffic Administration in an innovation process of smart street lighting. | Employees from the Traffic Administrations |
| 4 | Meeting | To discuss potential technology for making street lighting smart. | Employees and managers from the Traffic Administration and a subsidiary at the City of Stockholm, as well as a supplier |

3.2.4.2 Managing observations

The amount to register during an observation varies from taking some notes to video recording the whole event. The latter one is difficult to execute since it draws attention from the observed group. In both cases it is vital to summarize reflections from the observation afterwards (Merriam, 1988/1994). In the master's thesis notes were taken during the observation and reflections were written down directly afterwards.

3.3 Data analysis

There is no routine in analyzing the data gathered from a case study. The quality of the analysis will thereby depend on the researchers, the criteria used to interpret the data and in the logic used to link the data. Three examples of analytical techniques that can be used are; pattern matching, explanation building and time series analysis (Yin, 2012). Explanation building was the technique applied in the master's thesis to structure the analysis of the empirical data to get an understanding of the organizational and managerial challenges and the important critical success factors. The understanding will be built from analysis of the three data collection methods used; literature review, interviews and observations. The

material from each method will be analyzed on its own and then combined. One way the data was combined was through a summarized theoretical framework of organizational routines in innovation management and challenges in smart city initiatives derived from the literature review, which the empirical data was evaluated on. A second way was through comparing the empirical data to critical success factor to a smart city initiative.

3.3.1 Analysis of the theoretical framework

The theory from the literature review was analyzed and then summarized in a theoretical framework, which the analysis was based on. The empirical data was compared to the theoretical framework and the City of Stockholm's organizational and managerial challenges were identified. The important critical success factors were evaluated based on an existing framework.

3.3.2 Analysis of empirical data gathered from interviews and observations

According to Magnusson and Marecek (2015) the first step to analyze material is to formulate sub-questions to the research questions. The sub-questions will make it easier to work systematically with interview material. The next step is to portion the transcribed data into manageable parts, which refers to each sub question. It is important to work iteratively by reading and re-reading the material and formulating new sub-questions if necessary. The next step is to group repeating ideas from the material together. Finally, synthesize all that is learnt from each portion and sub-question into a whole. Check if what is learnt and observed fits into the whole picture (Magnusson and Marecek, 2015). The framework outlined was used to analyze the interview material. However, instead of using sub-questions, sub-categorizes were applied. In short, the procedure was as the one described below.

- Categorization of questions in the interview guide based on theory from innovation management and smart city,
- Suitable material from each interview transcription was selected and placed in respective categorization,
- The material was then divided into specific results saying for example, how many interviewees agreed on the specific matter or how many disagreed,
- The results were then combined into a text responding to each category.

The material from the observations was analyzed in a similar manner, categorized and complemented to the empirical data from the interviews.

3.3.3 Triangulation

The use of different methods to collect data improves the accuracy of the logical reasoning. By combining the data collected from different sources, convergences and divergences of evidence can be found. The convergences would support theories, whilst the divergences could lead to a deeper understanding and an opportunity to enrich and enhance the analysis. This method is called triangulation (Jick, 1979). The use of several collection methods helps to validate variances connected to the case and not to the method itself (Campbell and Fiske, 1959). The three different data collection methods used in the master's thesis will be combined through triangulation, to find the convergences and divergences.

The final step in the analysis is to determine if generalizations can be made from the case study. The literature distinguishes between two different kinds of generalizations, statistical and analytical. Statistical generalizations cannot be applied to a larger population from a small set of cases. In contrast, analytical generalization is applicable to case studies because connections in a certain group of concepts, theoretical framework or order of events can be found (Yin, 2012). Subsequently, analytical generalization was applied when the data collected was analyzed. The organizational and managerial challenges and the important critical success factors in managing towards a smart city, derived from the analysis of the City of Stockholm, can be applied to similar public actors wanting to transform into a smart city.

3.4 Summary of methodology

The research approach chosen in the master's thesis was a qualitative case study with an exploratory and evaluative research purpose to get an in-depth understanding. The main unit of analysis in the case study was the understanding of the organizational and managerial challenges and the important critical success factors the City of Stockholm faces when trying to become smart. The case study was chosen to have a single-case design with embedded units of analysis representing a cross-section of the City of Stockholm. A complementary literature review of methodology was also conducted to gather information about how to perform a case study. The data collection was, firstly, conducted through a literature review to gather theory about innovation management and smart city. The theory was condensed into a summarized theoretical framework. The framework was used to structure the empirical data collection, which consisted of semi-structured interviews and observer-participative observations. The empirical data was then transcribed, interpreted and analyzed by comparing it to the theoretical framework. In addition, the critical success factors were analyzed based on an existing framework to identify the important ones. Finally, conclusions were

derived from the analysis, which answered the research questions. A summary of the methodology applied in the master's thesis can be seen in Figure 3.5. As the figure shows the methodology process was iterative.

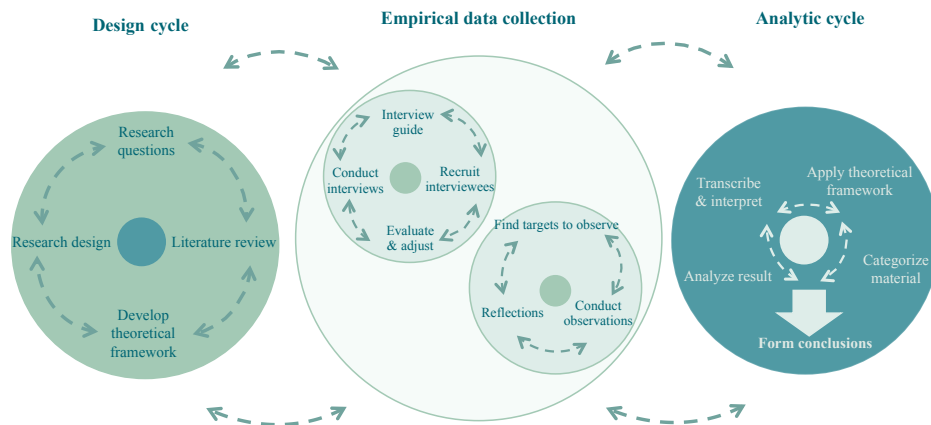


Figure 3.5 shows the methodology applied in the master's thesis. Authors' own figure inspired by Hennink, Hutter and Bailey (2011).

3.4.1 The work process

To sum up all activities from data collection to data analysis, and to get a sense of the work process a timeline was produced. The timeline and the actual outcome of the timeline can be found in Appendix B. In summary, the timeline involved the following activities:

1. Document defining the goal
2. Plan of master's thesis
3. Introduction
4. Theory
5. Methodology
6. Interview guide
7. Collecting empirical data through observation and interviews
8. Analysis and synthesis
9. Conclusions and recommendations for future research

3.5 Trustworthiness of the study

A qualitative research is conducted to understand or describe a certain phenomenon (Polit and Beck, 2004). However, qualitative case studies are often criticized for having too many subjective judgments to measure an attribute (Yin, 2003). Therefore, it is important to keep high quality (Cope, 2014). One way to measure the quality of an empirical research is through the trustworthiness of the study (Yin, 2003). The trustworthiness depends on the level of confidence in data, the interpretation and the methods applied to guarantee the quality (Polit and Beck, 2004). Demonstrating the trustworthiness of the study is critical to build confidence about the findings for the readers (Connelly, 2016). To ensure trustworthiness in the qualitative research four criteria were considered: credibility, dependability, confirmability and transferability (Lincoln and Guba, 1985; Polit and Beck, 2004).

3.5.1 Credibility

Credibility is an important aspect to consider for the trustworthiness of the study. The level of credibility depends on the extent the research methods generate confidence in the accuracy of the data and in the researcher's interpretations of the data (Polit and Beck, 2004). There are different methods for supporting credibility in a qualitative study; demonstrate engagement, methods of observation, audit trails (Cope, 2014) and in particular, through triangulation (Polit and Beck, 2004). Applying an audit trail means gathering material about interview transcripts, data analysis and process notes used during the research process to document the decisions and assumptions taken. The audit trail can be reviewed by another person to ensure that the conclusions and the interpretations are reasonable. In triangulation, the researcher combines several data collection methods to describe the studied phenomenon in a holistic way (Cope, 2014), see Section 3.3.3 for further details about triangulation. In the master's thesis several measures were taken to ensure high quality in the research methods and to achieve high levels of credibility. First of all triangulation was applied in the data analysis to combine sources and enhance the confidence in the interpretation of the data. Secondly, the research has been well documented throughout the master's thesis, generating an extensive audit trail. For example, all interviews were recorded and transcribed and all observations have detailed notes from two observers. Thirdly, the findings were presented to stakeholders at the City of Stockholm who confirmed the identified challenges in the organization. Additional presentations were requested to spread the findings throughout different departments at the City of Stockholm.

3.5.2 Transferability

Transferability is the degree to which discoveries and conclusions from the research can be applied to other settings (Lincoln and Guba, 1985). The criteria of transferability can be considered achieved if the findings are meaningful for other individuals outside of the research and they can correlate to encounters of their own (Cope, 2014). To allow the transferability to be evaluated it is critical for the researcher to provide information regarding the case specific settings. The extent of information provided would determine the ease of evaluating the usefulness the research findings have to other individuals (Polit and Beck, 2004). The transferability of the master's thesis was considered and special care was taken in providing the context of the case study to show the findings were applicable to other settings. The case study was conducted through a cross-section of the City of Stockholm to gather perspectives from top to bottom. First of all, the findings should be transferable to the City of Stockholm as a whole. Secondly, there are other public actors wanting to become smart cities as they are facing the same challenges in urban development as the City of Stockholm. Thus, they can adopt the identified organizational and managerial challenges derived from the analysis and review the important critical success factors to determine their potential in managing a smart city initiative.

3.5.3 Dependability

The dependability is the level of stability the data has over time and through different conditions (Polit and Beck, 2004). A study is dependable if the findings can be replicated under similar conditions using the same procedure as the researcher (Koch, 2006 cited in Cope, 2014). The study's dependability was considered. The routines in innovation management of the City of Stockholm will most likely change and develop over time why the findings in the master's thesis regarding its work to become smart was applicable at the time the research was conducted and can not be replicated over time. However, there will always be means of becoming smarter, with disruptive new technology and a continuously changing environment, why the organizational and managerial challenges for public actors will most likely be present in the foreseeable future.

3.5.4 Confirmability

The fourth criterion, confirmability, is accomplished when the three first criteria credibility, transferability and dependability are established (Lincoln and Guba, 1989, cited in Koch, 2006). Confirmability is connected to the level of objectivity applied by the researchers. The degree of confirmability reached in the research depends on to which extent the findings have been developed from the participants

and the context, rather than from the bias of the researchers (Polit and Becker, 2004). One method to enhance confirmability is through extensive audit linkages, which provides the ability to trace the findings back to the raw data. This allows insights to the research, determining if the findings are grounded in data (Lincoln and Guba, 1985). The encompassing audit trail, built in the master's thesis, provides individuals, external to the research, the ability to trace the source of the findings. Different types of sources were applied to enhance the reliability of the data and the logic of the interpretations.

4 Theory

This chapter focuses on the relevant theory intended to give the reader a comprehensive understanding of the literature review conducted. The theoretical framework presents existing literature and research on smart cities and innovation management. Ultimately, a summarized theoretical framework is given.

4.1 Smart city

An increasing number of cities are striving towards becoming smart, however there is little research about how to become one (Chourabi et. al., 2012). In addition, there is a lack of agreement about what a smart city is (Angelidou, 2014). The section aims at providing theory about the emergence of the smart city concept, a definition, the attributes and ultimately, the challenges cities face whilst trying to become smart.

4.1.1 The emergence of the smart city concept

A review of published material in LUBsearch, shows the emergence of the smart city concept, see Figure 4.1. From 1993 to 2010, published material about *Smart cities* and *Smart city* was basically absent. However, since 2010 the number of published material was drastically increased. Evidently, the graph is indicating that smart cities and smart city are two topics becoming more popular in research.

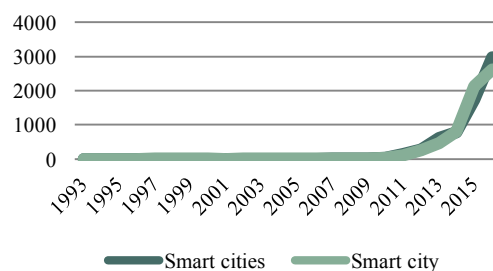


Figure 4.1 shows the published material about Smart city and Smart cities in LUBsearch from 1993 to 2016.

Cocchia (2014) describes a similar graph and suggests there are three occurrences, which could have had an impact on the development of the smart city concept and its increase in research material. The first occurrence was in 1997, when the Kyoto Protocol was established. The Protocol was a global agreement of 37 industrialized countries together with the European Community to reduce emissions (United Nations, 2014). The second occurrence happened in 2007, when Apple abrupt the market with its iPhone, which completely redefined the use of a mobile phone (Apple, 2007). From then on, smart devices have increased dramatically and today play a huge role in our everyday life (Cocchia, 2014). Finally, in 2010, the European Union launched the Europe 2020 Strategy, which focused on three mutually important priorities: smart growth, sustainable growth and inclusive growth (European Commission, 2010). As a consequence, each European country aimed to carry out smart initiatives in order to reach these targets (Cocchia, 2014). For these reasons, Cocchia (2014) argues that the increase in research topics is due to both technological drivers such as smart devices as well as political drivers such as the Kyoto Protocol and the Europe 2020 Strategy.

4.1.2 Definition of a smart city

Many different definitions of the smart city concept appear in literature, but there is not yet a unified definition universally acknowledged by practitioners and academia. Since the concept smart city is ambiguous and not used in a homogenous way, cities are identifying themselves as smart without referring to a standard definition (Cocchia, 2014). The term smart city is connected to several other concepts, for example, intelligent city, information city, digital city, etcetera, (Capdevila and Zarlenga, 2015). However, a literature review of different smart city definitions shows that smart city and digital city constitute the majority of the terminology being used in literature. Nevertheless, there are differences between the definitions of smart city and digital city. In smart city definitions, the human aspect is more highlighted than in the definitions of a digital city (Cocchia, 2014). Cocchia (2014) suggests the main reason for these differences is the different role ICT play for respectively city type. Evidently, digital city has ICT as its core component meanwhile for a smart city, ICT is an important component, but it does not describe the whole concept (Cocchia, 2014; Paquet, 2001). It is the human and social capital that is important rather than completely relying on IT per se, believing it can automatically derive change for cities (Hollands, 2008). Furthermore, the review indicated that the smart city definitions were more recently published than the definitions of digital city (Cocchia, 2014). Indicatively, Cocchia (2014) suggests that the smart city concept has arisen from the idea of the digital city together with the environmental requirements from EU and from social and human capital required to build a smart community. The study concludes that the different definitions of smart city show that there are different meanings

associated with a smart city, which more specifically concern environmental, social and digital aspects (Cocchia, 2014).

4.1.3 Attributes of a smart city

Besides not existing an unified definition, the smart city concept has various attributes and is used in different context, ranging from smart city as an IT district to a city with smart inhabitants. As a result, there are several fields of activity relating to smart cities; industry, education, participation and technical infrastructure (Giffinger et. al., 2007). Giffinger et. al. (2007) suggest there are six characteristics describing the performance of a smart city; smart economy, smart people, smart governance, smart mobility, smart environment and smart living. In contrast, Frost and Sullivan (2013) argue about eight factors recognized as common denominators among several smart city projects launched around the world. The factors presented were smart energy, smart building, smart mobility, smart healthcare, smart infrastructure, smart technology, smart governance and smart education and, ultimately, smart citizens (Frost and Sullivan, 2013). There are many traits in common when comparing the description of the attributes by the two authors, see Table 4.1 below. The only factor differing between the two sets of authors is *smart economy*, referring to the city's innovative spirit, ability to transform and productivity. The attribute *smart governance* is characterized by policies and digital services that encourages new, green and intelligent ideas (Giffinger et. al., 2007). In *smart mobility*, Giffinger et. al. (2007) includes both the availability of ICT and sustainable transportation, whereas Frost and Sullivan (2013) only refers to transportation and instead uses the term *smart technology* to indicate the availability of ICT.

Smart energy is according to Frost and Sullivan (2013) the use of technology to manage energy distribution and *smart infrastructure* is the systems, which integrate different intelligent infrastructures such as energy grids, water and waste management systems and telecommunications. Giffinger et. al. (2007) instead uses the term *smart environment*, which focuses more on the protection of the environment and the natural resources. *Smart living*, constitute different aspects of quality of life such as health, safety, education facilities, housing and culture (Giffinger et. al., 2007). Frost and Sullivan (2013) instead divide *smart living* into several terms; *smart building*, *smart security*, *smart education* and *smart healthcare*.

Table 4.1 shows attributes of a smart city and the terms used by the different sets of authors: Giffinger et. al. (2007) and Frost and Sullivan (2013).

| Dimension | Giffinger et. al. (2007) | Frost and Sullivan (2013) |
|-------------------|-----------------------------------|---|
| Smart people | x | x |
| Smart economy | x | |
| Smart governance | x | x |
| Smart mobility | ICT and transport | Transport only |
| Smart environment | x | Divided into <i>smart energy use</i> and <i>smart infrastructure</i> , however less focus on protection of the environment. |
| Smart living | x | Divided into <i>smart building</i> , <i>smart security</i> , <i>smart education</i> and <i>smart healthcare</i> |
| Smart technology | Included in <i>smart mobility</i> | x |

4.1.4 Critical success factors and associated challenges of becoming a smart city

Becoming a smart city induces many challenges for public actors (Monzon, 2015). To understand how a city is working towards becoming smart, Chourabi et. al. (2012) suggest eight critical success factors and several challenges to each factor. The success factors are compounded into a framework called the *Smart City Initiative Framework*, which has two levels of influence, the inner and the outer factors, see Figure 4.2. The outer factors and the inner factors impact each other and the success of the smart city initiative, why the framework needs to be considered holistically (Chourabi et. al., 2012). The inner and the outer factors are described below.

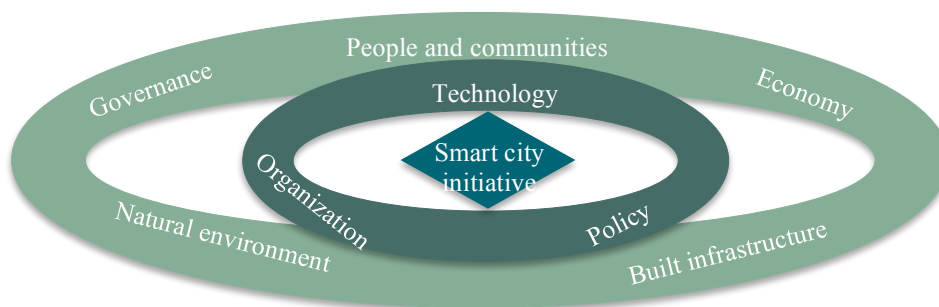


Figure 4.2 shows the Smart City Initiative Framework and its eight inner and outer factors affecting the smart city initiative (Chourabi et. al., 2012).

4.1.4.1 The inner factors and its challenges

The inner critical success factors to a smart city initiative are policy, technology and management and organization (Chourabi et. al., 2012). According to Chourabi et. al. (2012) the inner factors have greater, direct impact on the smart city initiative. The technological side of a smart city is often highlighted, whereas policy concerns are often neglected (Nam and Pardo, 2011). The shift towards a smart city involves the interaction of technology with political and institutional elements (Mauher and Smokvina, 2006). The transformation to a smart city requires innovation (Naphade et. al., 2011). While innovation in technology for a smart city is often considered more tangible, changes in policy are more uncertain (Hartley, 2005). However, governmental innovation cannot succeed without changes in policy (Eger and Maggipinto, 2010 cited in Chourabi et. al., 2012). Regarding the factor technology, ICTs are important drivers of smart city initiatives (Hollands, 2008) and can improve the life of the citizens, but also increase inequalities and a digital divide (Odendaal, 2003). Concerning the final factor, management and organization, there is little prior research in the subject for public actors (Chourabi et. al., 2012). Challenges related to the inner factor are listed in Table 4.2 below.

Table 4.2 lists the challenges corresponding to respective critical success factor in the inner level of influence.

| Inner critical success factors | Challenges |
|------------------------------------|---|
| Management and organization | <ul style="list-style-type: none"> • Manager’s attitudes and behavior, • Multiple or conflicting goals, • Lack of alignment of organizational goals and projects, • Resistance to change (Chourabi et. al., 2012) |
| Technology | <ul style="list-style-type: none"> • Lack of integration skills and culture, • Lack of cross-sectorial cooperation and interdepartmental coordination, • Unclear vision of management strategy, • Politics and culture issues (Ebrahim and Irani, 2005) |
| Policy | <ul style="list-style-type: none"> • Lack of normative drive in policy changes (Eger and Maggipinto, 2010 cited in Chourabi et. al., 2012) |

4.1.4.2 The outer factors and its challenges

The outer factors are governance, people and communities, economy, built infrastructure and natural environment. The outer factors filter through the inner factors before affecting the success of the smart city initiative (Chourabi et. al., 2012). Firstly, governance is smart when it is founded on citizen involvement (Giffinger et. al., 2007), has public and private partnership and the communication is based on ICT (Odendaal, 2003). Capdevila and Zarlenga (2015) argue that even though smart city initiatives are intended to improve the life of the citizens, policies are often top-down and implemented by institutions, rather than involving the citizens. Regarding people and communities, they are an important part of the

city since they are the end consumer of the smart city. It is therefore vital that they are a part of the decisions and engaged in the implementation of a smart city program (Gascó, 2016). Historically, citizens are often considered as users, testers or consumers, rather than producers and sources of creativity and innovation (Capdevila and Zarlenga, 2015).

Regarding economy, creating an environment for business development is vital for a smart city (Bronstein, 2009), since the initiatives triggers job creation, business creation and improved productivity (Chourabi et. al., 2012). Built infrastructure, in particular the availability and quality of ICT infrastructure, is of great importance in the development of a smart city. The ICT infrastructure refers to both wireless and service-oriented information systems, including fiber optic channels, Wi-Fi networks and wireless hotspots (Chourabi et. al., 2012). Finally, the natural environment, smart cities should be progressive regarding environmental issues and strive to become completely sustainable (Giffinger et. al., 2007). Challenges related to the five outer factors are listed in Table 4.3.

Table 4.3 lists the challenges corresponding to respective critical success factor in the outer level of influence.

| Outer critical success factors | Challenges |
|--------------------------------|--|
| Governance | <ul style="list-style-type: none"> • Collaboration among stakeholders, • Management support, • Leadership and champion, • Involvement, • Communication and data-exchange, • Service and application integration (Chourabi et. al., 2012) |
| People and communities, | <ul style="list-style-type: none"> • Accountability and transparency, • Community gatekeepers, • Education, • Accessibility, • Participation and partnership (Chourabi et. al., 2012) |
| Economy | <ul style="list-style-type: none"> • Involving the industry (Snow, Obel and Håkonsson, 2016) |
| Built infrastructure | <ul style="list-style-type: none"> • Lack of integration across government systems, • Threats from hackers and viruses and high cost of installation, • Operation and maintenance (Ebrahim and Irani, 2005) |
| Natural environment | <ul style="list-style-type: none"> • Sustainability (Chourabi et. al., 2012) |

Reviewing the challenges from inner and outer critical success factors, see Table 4.2 and Table 4.3, they appear to be connected to managerial and organizational challenges. From the two listed tables above the challenges can be summed up as; lack of clear guidance and vision, lack of collaboration, lack of management support, lack of involvement, lack of communication, lack of citizen participation, lack of integration across government systems and lack of sustainability focus. Conclusively, the challenges a public actor need to face when becoming a smart

city mostly seem managerial. However, little research focus on how managerial and organizational challenges are addressed for smart city initiatives (Chourabi et. al., 2012).

4.2 Organizational routines in innovation management

In the transformation towards becoming a smart city, innovation in management is required (Naphade et. al., 2011). Some organizations have been successful in their innovation management by understanding their routines linked with success. However, since these routines are embedded in the organization and learned over time they are not easy to acquire. Therefore, organizations must improve and build effective routines, by recognizing which ones to avoid and which ones to allow. Creating favorable conditions where effective routines are enhanced will make organizations better equipped to handle uncertainties and thus lead to successful innovation management (Tidd, Bessant and Pavitt, 2005). The following section intends to discuss theory about the concept of innovation management, starting with a definition of innovation and further investigating innovation management to understand its effect on organizations.

4.2.1 Definition of innovation

Today there exists a diverse range of definitions regarding innovation. Although, the lack of a clear definition creates confusion and extensive research has been dedicated to innovation, there is yet no authoritative definition (Baregheh, Rowley and Sambrook, 2009). It is common to associate innovation with new products, materials, new process, new services and new organizations (Baregheh, Rowley and Sambrook, 2009), however, innovation can also be defined as a process (Damanpour, 1991), as well as the outcome of a process (George, Zahra and Wood, 2002). Innovation could, for example, be described as a process including “the technical, design, manufacturing, management and commercial activities involved in the marketing of a new (or improved) product or the first use of a new (or improved) manufacturing process or equipment” (Freeman, 1974 cited in Rothwell, 1992).

Innovations can be categorized into different types. In literature these different types of innovation are usually separated if the innovation changes the core concept, radical innovation, or if the innovation merely updates the product, incremental innovation (Forés and Camison, 2016). These two types can be seen as two extremes in a spectrum (Abernathy and Utterback, 1978). Research shows that both these types of innovations, incremental and radical, are necessary for the long-term survival of an organization (Farjoun, 2010; He and Wong, 2004; Probst and Raisch, 2005).

4.2.2 Understanding organizational routines

Today's ever-changing environment has made it necessary for public actors to enhance the competence in managing change and innovation (Brown and Osborne, 2005). However, there is little research about innovation management for public actors (Wihlman, et. al., 2016). Therefore, an innovation management model presented by Tidd, Bessant and Pavitt will be used as inspiration for understanding the subject, since this model is established within the literature of innovation management. Tidd, Bessant and Pavitt (2013) list the organizational context as a critical behavior pattern or routine to innovation management and argue that successful innovation can only happen within a supporting organizational context. For instance, a study by IBM revealed that 35 percent of the 765 participating CEOs declared that an "unsupportive culture and climate" were the roadblocks to innovation within an organization (Chapman, 2006). Correspondingly, successfully managing or implementing an innovation culture provides a competitive advantage (Brooke Dobni, 2008) and is critical to organizational performance (Hurley, Hult and Knight, 2008). An innovative organization is more than a structure or process, it is a combination of components interacting to create and reinforce an environment, which enables innovation to flourish (Tidd and Bessant, 2013). Analyzing which routines to improve and which ones to discontinue will help organizations to understand how to improve their innovation management. Therefore, in the following section six routines critical for innovation management are discussed; shared vision, internal involvement, the learning organization, customer participation, collaboration and creating a climate where ideas can flourish (Tidd, Bessant and Pavitt, 2005).

4.2.2.1 Shared vision

Organizations and employees tend to develop routines and procedures to strengthen the status quo. To change the mindset and the established routines, the organizations need to form new visions to together strive towards. Leaders incorporating a sense of a clear common purpose will act as an active change agent to the organization (Tidd, Bessant and Pavitt, 2005). Involving the employees in understanding the vision, mission and goals of the organization leads to higher levels of commitment to the success of the organization. Challenging the employees daily to reach higher achievements makes people both more invested in the success of the organization and in their personal development. If the challenge and involvement are too low, employees become indifferent to the progress of the organization, uncaring about their personal development and are frustrated about the future of the organization (Tidd and Bessant, 2013). Having a mutual agreement and a unified commitment to a clear elevating vision is key to high performance (Isaksen and Lauer, 2002).

4.2.2.2 Internal involvement

Involving the employees in the process of decision-making improves chances of acceptance and smooth implementation of the decisions taken (Isaksen and Lauer, 2002).

4.2.2.2.1 Management support

Top management commitment is of highest importance to be able to change the status quo (Tidd, Bessant and Pavitt, 2005) and is correlated with successful innovation. Moreover, the employee's degree of commitment to the organization depends strongly on the management's ability to inspire a shared vision (Niehoff, Enz and Grover, 1990). However, to execute it in reality is a challenge (Tidd and Bessant, 2013). Nevertheless, Khalili (2017) argues that leadership aimed at generating creative and innovative environment can be developed. The key lies in finding approaches that emphasize the sense of management involvement, commitment, enthusiasm and support in the organization, in particular to major long-term projects (Tidd and Bessant, 2013). The management must be committed to innovation since it acts as a catalyst in the innovation processes (Urgal, Quintás and Arévalo-Tomé, 2013). Furthermore, it is important that leaders both reward and provide feedback to the employees on their accomplishments to achieve high performance. The leader should also manage human differences, care for capable members and encourage an environment in which all members can contribute (Isaksen and Lauer, 2002).

4.2.2.2.2 Involvement in innovation

High involvement in innovation is about including all employees in organization-wide continuous improvement activities. Innovation is often perceived as something that has to do with specialist in R&D, marketing, design or IT, but creativity and problem solving are skills that all employees in the organization possess. If an organization manages to align these capabilities across the entire organization, the innovative potential can be enormous. Although, each employee may only contribute to limited incremental innovations, the sum of all efforts can have a great impact (Tidd and Bessant, 2013). Bessant (2003) developed a model called the Five Stage High Involvement Innovation Model demonstrating five stages required to progress into a high involvement practice (Bessant, 2003 cited in Tidd and Bessant, 2013), see Figure 4.3 below.

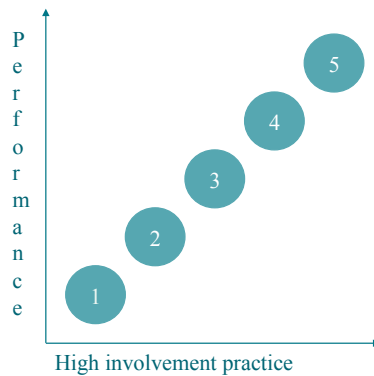


Figure 4.3 shows the five-stage high involvement innovation model explaining the evolution of high involvement in innovation capability (Bessant, 2003 cited in Tidd and Bessant, 2013).

1 *Unconscious high involvement in innovation*

The first stage is characterized by an unconscious involvement in innovation. There is little or no involvement and when it does happen it is randomly and occasionally. People help to solve problems but there is no formal efforts or structure of doing this. Not surprisingly, does this sort of change activity contribute to impact on a smaller scale (Bessant, 2003 cited in Tidd and Bessant, 2013).

2 *Structured high involvement in innovation*

The second stage represents a first serious effort to create and sustain high involvement in innovation in the organization. Progressing to this stage involves setting up a formal process for identifying and solving problems, making sure people are trained and encouraged about how to use this process and enforce a structured idea management system to process as many ideas as possible and handling those that cannot be implemented. Successful innovation is dependent on how an organization manages projects from idea to commercial product or service (Tidd, Bessant and Pavitt, 2001). Managing these phases requires routines. However, many organizations lack structure in these routines and it happens adhocly. (Tidd, Bessant and Pavitt, 2005). Top management commitment and resource supply are crucial aspects during this stage (Bessant, 2003 cited in Tidd and Bessant, 2013).

3 *Goal-oriented high involvement in innovation*

The third stage is about aligning the involvement with the strategic goals to merge all local-level improvement activities into one. This involves communicating the overall strategy, separating it into manageable objectives and coordinating which

involvement activities will target which area in the organization. Additionally, there is a need to measure the performance against the strategic goals. At this stage, management still mainly sets the direction of activities, although the activities may take place at different levels in the organization. Therefore, moving up to stage four implies empowering individuals and groups, creating a culture where they can innovate and experiment on their own initiative (Bessant, 2003 cited in Tidd and Bessant, 2013).

4 Empowered high involvement in innovation

At this stage the involvement activities are internally directed rather than from management and there is a high level of experimentation (Bessant, 2003 cited in Tidd and Bessant, 2013).

5 Full high involvement in innovation capability

The fifth and last stage is simply a condition where every employee is fully involved in the innovation process and all employees share knowledge to create an active learning organization. At this stage, both incremental and radical innovations are possible to achieve (Bessant, 2003 cited in Tidd and Bessant, 2013).

4.2.2.3 The learning organization

Knowledge has become the sources of competitiveness in the twenty-first century (Tidd, Bessant and Pavitt, 2005). With increasing competition, technology advancement and shifting customer preferences, it is critical to the survival of organizations to become learning organizations. In a learning organization the employees continuously collect, spread and incorporate knowledge helping the organization to adapt to its uncertain and ever-changing conditions (Garvin, Edmondson and Gino, 2008). Hult et. al. (2004) argues that the learning orientation has a powerful effect on the level of innovativeness of the firm. For each time an organization goes through an innovation process, new knowledge is acquired. The knowledge does not only concern the innovation itself, but also the management of the innovation process. Therefore, also unsuccessful projects could be a great source of knowledge building and gain the organization future options to exploit (Tidd, Bessant and Pavitt, 2005).

According to Garvin, Edmondson and Gino (2008) the learning organization have three building blocks; a supportive learning environment, concrete learning processes and practices and leadership behavior that provides reinforcement. Each of the building blocks have subcomponents important to its success. The first building block, a supportive learning environment, includes components such as openness to new ideas, appreciation of employees having opposing ideas, time for reflection and psychological safety (Garvin, Edmondson and Gino, 2008). A

certain level of conflict and debate makes an organization productive (Tidd and Bessant, 2013). When employees debate opposing ideas, learning occurs and new ideas spark to life (Garvin, Edmondson and Gino, 2008).

The second building block, concrete learning processes and practices refers to the generation, collection and interpretation of information. The knowledge must also be shared in a systematic and clearly defined way. Knowledge sharing can both be internally focused, through feedback loops of internal projects and processes, and externally focused, involving for example regular forums learning from customer perspectives. Together these processes guarantee effective and efficient information flows throughout the organization. The final building block, leadership that reinforces learning, focuses on the influence leaders have on learning. Organizations with leaders emphasizing on the significance of spending time on problem solving, knowledge sharing and reflection, are more likely to be successful in these activities (Garvin, Edmondson and Gino, 2008).

4.2.2.4 Customer participation

Involving the customers is a critical success factor for all types of projects (Dvir and Lipovetsky, 1998). In addition, an external focus with a clear market orientation is key to the innovativeness and business performance (Hult et. al., 2004). Understanding key customers, having a clear customer orientation, collaborating with partners and developing networks of sources leads to higher performance and innovations fitted to the customers (Tidd and Bessant, 2013). The market orientation is a source of ideas and will lead to an organization with higher motivation to respond to changes in the environment (Hult et. al., 2004). Involving lead users is particularly important in the development and adoption of complex products or services (Tidd, Bessant and Pavitt, 2005).

4.2.2.5 Collaboration

Even an organization with the most well-established and advanced systems for generating new innovations is unlikely to succeed, if the surrounding organizational environment is unfavorable. High performance and successfully meeting market demands are both associated with coordination and cooperation within the organization (Tidd, Bessant and Pavitt, 2005).

4.2.2.5.1 The degree of cross-functionality

Smooth information flows and cross-functional cooperation are two attributes recognized as important success factors for an innovative organization. Therefore, a rigid hierarchical organization, with top-down communication and where functional silos are prevalent, is highly unlikely to be innovative. Additionally, engaging citizens in a bottom-up approach has shown to be critical for innovation in the development of smart cities (Coe, Paquet and Roy, 2001). Innovation is not an activity confined to the R&D department, but a corporate wide task involving the whole organization. In order to cultivate a climate of creativity, learning and

interaction, a suitable organization structure needs to be applied. Accomplishing this is not easy (Tidd and Bessant, 2013). Organizations require a more organic structure, flexible and adaptable to changes (Miles and Snow, 1978, cited in Tidd, Bessant and Pavitt, 2005).

The presence of key individuals is essential to the innovative organization. These key individuals could be described as promoters, champions and gatekeepers enabling and energizing innovation (Tidd and Bessant, 2013). Champions play significant role in implementing new ideas by persistently promoting the innovation, securing resources, involving and motivating others and continuously conveying the strategic significance of the innovation (Howell and Boies, 2004). Research has shown that key individuals often enable information flows and networks within the organization. These gatekeepers gather information from a vast amount of sources, passing the information on through the network to the relevant people. However, in the same way as individuals championing innovations can be identified, individuals disabling innovation exist in organizations as well (Tidd and Bessant, 2013).

4.2.2.5.2 The level of flexibility in the organization structure

To manage complexity and uncertainty, a great deal of flexibility is required in the organizational structures and processes. Historically, structures have been built for stability, but with the increasing importance of innovation, the traditional structures are challenged by the consequent agility required. For these reasons, the key success factor of managing innovation is to apply the most adequate structural forms fitting for the particular circumstances (Tidd and Bessant, 2013). The less programmed and the more unpredictable the assignment, the greater the need is for flexibility (Tidd, Bessant and Pavitt, 2005). Flexible organizational structures allow the employees to rapidly reorganize to collaborate (Lawrence and Lorsch, 1967, cited in Tidd, Bessant and Pavitt, 2005). Damanpoura and Gopalakrishnanb (1998) argue organizational features and the environmental conditions are connected to the organization's ability to effectively innovate. The authors connected an unpredictable environment and a high adoption rate of innovation to organic, flexible and adaptable organizations (Damanpoura and Gopalakrishnanb, 1998). The amount of initiative individuals take depends on the level of autonomy the employees have to design their work. An organization with authoritarian leaders and a lot of bureaucracy is characterized by people taking few initiatives (Tidd and Bessant, 2013).

4.2.2.6 *Creating a climate where ideas can flourish*

Organizational structures are the visible artifacts of an organization's innovative culture. It is not possible for management to change the innovative culture overnight and must certainly not through single initiatives such as mass training in a new technique. It takes time, and management must instead focus on improving structures and processes and reinforcing a favored set of behaviors. There are

several critical success factors for an innovative climate, some of them concern the receptiveness of new ideas, the time set for new ideas and risk taking discussed below (Tidd and Bessant, 2013).

4.2.2.6.1 The receptiveness of new ideas

It is important to have a climate with a high level of trust and straightforward communication for the employees to feel comfortable when bringing forward ideas. When there is a lack of trust, openness and the expenses for mistakes are high, people are reluctant to share ideas (Tidd and Bessant, 2013). In addition, if employees are afraid of being belittled when disagreeing with managers or co-workers or bringing forward an idea, innovativeness of the firm will be diminished and the organization decrease its ability to learn (Garvin, Edmondson and Gino, 2008).

4.2.2.6.2 The time set for new ideas

Kanter (2013) argues a lack of time hinders innovation in an organization. People need time outside of current projects and tasks to investigate new ideas and for professional development. If the employees are heavily work loaded, all levels in the organization will only be concerned with the daily tasks and management will not support new ideas (Tidd and Bessant, 2013). At Google, a company widely known for its innovative culture, employees are expected to spend 20 percent of their time investigating new ideas and ten percent of their time involved in developing completely new businesses or products (Iyer and Davenport, 2008).

4.2.2.6.3 Risk tasking

Hogan and Coote (2013) highlighted in their research the importance of an organizational culture “that values, expects and facilitates calculated risk-taking and a willingness to challenge the status quo”. Innovating and implementing new ideas are linked with risk taking. An organization must accept and embrace some levels of uncertainty to make room for innovation (Tidd and Bessant, 2013). The employees should be encouraged to experiment and take risks (Garvin, Edmondson and Gino, 2008). The key is to find a balance between a risk-averse organization not daring to try any new ideas outside the comfort zone and too much risk putting the company in jeopardy (Tidd and Bessant, 2013).

4.3 Summarize of the theoretical framework

Comparing the challenges public actors face when transforming into a smart city to the routines required for successful innovation management, it is evident there are many similarities. The aim of this study was to investigate how a public actor, the City of Stockholm, is working towards becoming a smart city by answering the

research questions; What are the organizational and managerial challenges for the City of Stockholm of becoming a smart city? and Which are the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city? Therefore, a theoretical framework was summarized, see Table 4.4 below. The framework compounds the organizational routines required for successful innovation management and the challenges derived from smart city theory. The smart city challenges were categorized based on the match with each organizational routine. The theoretical framework can be used to investigate the organizational and managerial challenges for the City of Stockholm in their transformation in becoming smart by comparing the organizational routines in innovation management to the smart city challenges.

Table 4.4 lists the organizational routines required for successful innovation management derived from the theory and the smart city challenges matching each category.

| Organizational routines in innovation management | Smart city challenges |
|--|--|
| Shared vision | <ul style="list-style-type: none"> • Multiple or conflicting goals • Lack of normative drive in policy changes • Unclear vision of management strategy |
| Internal involvement <ul style="list-style-type: none"> • Management support • Involvement in innovation | <ul style="list-style-type: none"> • Involvement • Participation and partnership • Management support • Accountability and transparency • Lack of alignment of organizational goals and projects • Unclear vision of management strategy |
| Learning organization | <ul style="list-style-type: none"> • Accessibility • Communication and data-exchange |
| Customer participation | <ul style="list-style-type: none"> • Involving the industry • Participation and partnership • Community gatekeepers • Education |
| Collaboration <ul style="list-style-type: none"> • The degree of cross-functionality • The level of flexibility in the organization structure | <ul style="list-style-type: none"> • Collaboration among stakeholders • Lack of integration skills and culture • Lack of cross-sectorial cooperation and interdepartmental coordination • Lack of integration across government systems • Leadership and champion |
| Creating a climate where ideas can flourish <ul style="list-style-type: none"> • The receptiveness of new ideas • The time set for new ideas • Risk taking | <ul style="list-style-type: none"> • Manager's attitudes and behavior • Resistance to change • Politics and culture issues |

The smart city challenges that did not fit into any organizational routine in innovation management were: service and application integration, operation and maintenance, sustainability and threats from hackers and viruses and high cost of installation. These challenges will not be further investigated in the empirical data neither in the analysis.

Ultimately, the City of Stockholm's work can be evaluated based on the critical success factors to smart city initiatives to identify the important critical success factors for public actors, like the City of Stockholm, in managing towards a smart city.

5 Empirical data

This chapter presents empirical data gathered through observations and interviews at the City of Stockholm to understand the smart city work carried out and the organizational routines in innovation management.

5.1 Interview and observation result

The purpose of the study was to identify the organizational and managerial challenges and the important critical success factors a public actor faces when managing towards a smart city. In order to fulfill the purpose and for the study to result in specific findings, two research questions were determined; What are the managerial and organizational challenges of becoming a smart city? and Which are the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city?

Ten interviews and four observations were carried out at the City of Stockholm to gather empirical data as an approach to answer the research questions. The interviews and the observations were carried out through a cross-section of the City of Stockholm, in particular from the Traffic Administration as well as from the City Executive Office, to understand the work towards becoming smart from a top to bottom perspective and to gather different point of views. The interviewees and the persons of observations have been viewed as embedded units of analysis and the City of Stockholm as the context. However, when relevant, the specific units of the cross-section were mentioned in the empirical data, for example the Traffic Administration and its business units, and the City Executive Office. In addition, in quotations, the interviewee or observed person's position was stated, either manager or employee. The empirical data was divided into two parts. The first part is about the smart city work carried out until now at the City of Stockholm to give an understanding of the background. The second part regards the city's organizational routines in innovation management.

5.1.1 The smart city work until now at the City of Stockholm

In April 2017, the City of Stockholm adopted a strategy to become the world's smartest and most connected city, see Section 2.2 for further details. The prior work with developing the strategy has been done and the strategy is now at its initial implementation phase. However, the thoughts about the development process and the initial implementation differ among the employees interviewed and observed. In addition, at the Traffic Administration, a group called *The Smart City Group*, has been formed to investigate the possibilities smart cities implies, coordinate smart city efforts and implement the smart city concept at the Traffic Administration.

5.1.1.1 *The development and the initial implementation of the strategy*

Reviewing the empirical data, the level of participation in the strategy development varied significantly, why the perception of involvement differed between the interviewees. The strategy was for example handed out for referral through the organization and opinions were gathered, according to three interviewees. Two interviewees stated the Traffic Administration was highly involved in the development process and gave comments in the referral circulation. In particular, one employee pointed out during an observation that even though there is a vision and strategy centrally, the organization has yet to break down the vision and define their role in the transformation. For example, the Traffic Administration does not have a specific vision or any goals of how they will contribute to the smart city solely a few smart city projects.

According to one of the interviewees the members from the City Executive Office have started to visit the companies and administrations of the City of Stockholm to anchor the strategy. Another interviewee mentioned that the strategy is already set in motion, for instance, some of the prioritized projects to be implemented by business units have been identified. However, another person working at the Traffic Administration claimed they basically had one day in cooperation with consultants from the City Executive Office to develop smart city projects and make economical calculations. The person thinks that a lot of smart city projects were hastily started just to make units involved, instead of filling a substantial need. Furthermore, the person argues that the projects need to be put together and prioritized in a certain way to get the added value. Moreover, another person claimed the information about which projects that will be centrally funded is lacking, what the budget will be or how these projects will be realized.

5.1.1.2 *The Smart City Group*

The Smart City Group is a group with the purpose to initiate the smart city work at the Traffic Administration. The background of the Smart City Group was given by one of the interviewees. The person stated that a group was formed a few years ago at the Traffic Administration to investigate the development of ICT. The

group was then called the ICT group and the members were people interested in the technology, mainly from the IT department at the Traffic Administration. Later, the City Executive Office developed the smart city strategy. The group realized that a great deal of the adopted strategy would affect the Traffic Administration and the group reformed into the so called Smart City Group. The person continued by arguing that the work of the group should not become a product of the IT department. The work should include the whole Traffic Administration. Furthermore, the work should not be focused on technology and technology for the sake of technology.

“Naturally we have to understand the technological possibilities and transform those into value for the society”

- Manager, the Traffic Administration

Another person mentioned that when the smart city project centrally had been at a stand still, the Traffic Administration wanted to move on with the smart city work. Therefore the Smart City Group was initiated. There has been an agreement between the group and the City Executive Office that the work of the group will follow the strategy.

The Smart City Group is composed by employees from different departments at the Traffic Administration, according to one of the interviewees. Another person mentioned that managers from each department chose the members of the Smart City Group. The members were selected in accordance with a description and criteria written by the manager of the Smart City Group. Another person argued that the Traffic Administration is not staffing the group with enough resources. The Smart City Group is today in a phase of consolidation. The group has tried to increase the knowledge about ICT and the possibilities connected to smart cities. One person claimed that the group does not know what they should do nor the way forward. Another person mentioned that the aim of the group is for the members to devote 30 percent of their time to work related to smart city. However, the managers seemed not be inclined to let the members dedicate this much time and the person believed it is a risk that the group and the managers have different ambitions. Moreover, the person had not participated in the Smart City Group as much as the person thought the project deserved, above all because the person felt unsuited for the group.

5.1.2 Understanding the City of Stockholm's organizational routines in innovation management

The empirical data is categorized based on six routines derived in the theoretical framework as important for successful innovation management. The investigation of these routines will form the basis to understand the City of Stockholm's managerial and organizational challenges and the important critical success factors when transforming into a smart city. These routines are shared vision, internal involvement, learning organization, customer participation, collaboration and creating a creative climate where ideas can flourish.

5.1.2.1 *The vision of a smart city*

The organizational routines of having a shared vision at the City of Stockholm, as a smart city, were investigated. In particular, the investigation was focused on examining the participants' definitions of a smart city and their knowledge about the smart city strategy.

5.1.2.1.1 Definition of a smart city

All ten interviewees had heard about the term smart city and nine of these could elaborate on the concept. Two persons were unsure about the meaning of smart cities and another person had not given it much thought. One person, a manager, provided several definitions and was also the only one to mention the smart city definition articulated by the City of Stockholm and to further elaborate on its four sustainability principles. Another person discussed several ways of being smart and that the word itself has evolved into various meanings. In addition, different aspects of the smart city were elaborated on. **Nine out of ten interviewees mentioned technology** when they discussed their interpretation of the smart city. Some of them talked about technology as the foundation of the smart city, whereas others mentioned it as an enabler.

“The expression is about something that of course has to do with a lot of technology, the type of infrastructure we have, what sorts of platforms and what type of data we gather”.

- Manager, the City Executive Office

“The technology is a part of the enabling, or a big part of the enabling, but a smaller part of the realization”.

- Manager, the Traffic Administration

Two interviewees out of ten commented on the **environmental aspect** of smart cities. Additionally, **three interviewees** discussed **citizens** as a component of the concept, they mentioned how smart cities could deliver a value to its citizens, help them or make them feel smart.

“It should work for the mother-in-law who is 85 years old and it should work for my kids going to school”.

- Employee, the City Executive Office

Finally, one person said it would be beneficial if all employees at the City of Stockholm had the same perception of what a smart city is so that all employees are working towards the same goal.

5.1.2.1.2 Knowledge about the smart city strategy

All interviewees asked about the smart city strategy during the interviews **had heard about** it. However, four of them **could not remember the content** of the strategy.

“I do not know more than that the city wants to become the smartest and most connected to 2040 and I think it says the same things on a lot of pages”.

- Employee, the Traffic Administration

Different point of views appeared regarding the level of participation in the smart city strategy development. Five interviewees said they had been involved in developing the strategy. Three interviewees mentioned that the Traffic Administration were involved in the development of the strategy. One said that the strategy had been out on referral. All employees at the Traffic Administration had had the chance to make a statement and the IT unit in particular had had opinions. However, one person thought that not many employees at the Traffic Administration had taken part in the strategy development. Furthermore, one person believed that there were no specific activities or projects defined yet in relation to the smart city strategy. Whereas, in contrast, another person mentioned several projects identified and initiated as smart city projects. One person thought the strategy created an ambition and an overall strategy of a general direction, but not much about how to get there. The person argued that it had been left up to the operations to solve how to become smart.

During an observation, a discussion between employees revealed the great differences in the level of knowledge about smart cities and the smart city strategy; **many of the employees had never seen or heard about the strategy**, whereas a

few had strong opinions regarding the subject and a well developed perception of smart cities and its components. For example one person stated, when asked what a smart city is:

“...it has something to do with trash bins right? ... trash bins that will tell when they are full”.

- Employee, the Traffic Administration

In summary, the organizational and managerial challenges for shared vision at the City of Stockholm were:

- Different definitions of the smart city concept
- Few mentioned the social aspect, citizens, and the environmental aspect as parts of the definition
- Few were familiar with the content in the smart city strategy
- Different perceptions of the level of participation in the smart city strategy development
- The smart city strategy had been poorly communicated

5.1.2.2 The level of internal involvement

The organizational routines for internal involvement at the City of Stockholm are addressed in the next section. In particular, the empirical data elaborates on the management support and involved and structured innovation. Innovation in this context refers to the smart city initiative.

5.1.2.2.1 Perceptions of management support

During the interviews it became clear that some of the interviewees felt the management support was poor meanwhile others had a more positive view. **Two of the managers** interviewed felt they had **support from senior management**. For example, one of them said there is trust from the politicians towards the employees to be loyal and work in an appropriate way. There was one person who had a split image of the management support. On one hand, the person said the closest manager had been a motive force and had supplied resources, both in terms of budget and in terms of time. On the other hand, the person had not experienced support in terms of decision-making. The person said this was probably not because of the manager but rather the manager's manager. **Four of the interviewees** had a **more negative impression**. They mentioned the following problems:

- Poor communication
- Lack of understanding the amount of stress the employees are exposed to
- Unclear guidance

- Managers being ambiguous in their management and in their directions regarding smart cities; the work procedures and the resources needed.

“What I am missing is directions from above, where we are going with this, work procedures and resources”.

- Employee, the Traffic Administration

“The managers will never be able to be the driving force in this without getting help”...” having it explained; this is what we need to do, and then it’s seldom difficult to anchor it...”

- Manager, the Traffic Administration

There was one interviewee who felt the management wanted the smart city initiatives to be bottom-up. However, this person said it might not be the only way and suggested managers should be responsible as well. Management need to clarify how a smart city is defined and what is being measured. Therefore, inducing a top-down approach. Another manager had a completely different point of view. The manager said the engineers are responsible for introducing new ideas and then as a manager the person can come with suggestions of how to progress.

The communication from the City Executive Office was also discussed. **Several of the employees felt that little of the communication about the strategy were directed internally.** Moreover, two of the interviewees stated that they **do not yet know how the overall smart city strategy will affect the work at the Traffic Administration.** Likewise, a manager highly involved in the smart city work expressed the lack of knowledge regarding the future smart city plans from the City Executive Office.

5.1.2.2.2 Involved and structured innovation

The empirical data about involvement in innovation was divided into smart city involvement and the structure of innovation processes.

5.1.2.2.2.1 Smart city involvement

Eight out of ten interviewees are involved in some sort of smart city work at the City of Stockholm. **Among the interviewees involved in the smart city work, smart cities are discussed on a daily basis.** Two of those interviewees stated that the City of Stockholm’s transition to become a smart city is their main focus. In addition, a third one does not see smart cities as a separate topic that is discussed on its own, but rather something that permeates all daily conversations. **However, among those employees not involved, smart cities are hardly discussed at all.**

One person suggested smart cities are being discussed in specific groups involved in smart city projects.

“The others know so far only that there is a project called Smart city. They do not know much more than that”.

- Employee, the Traffic Administration

“There is no talk in my corridor...”

- Employee, the Traffic Administration

For instance, one person stated that smart cities were not a discussed topic at one of the business units at the Traffic Administration. Another employee, from the same business unit, could not remember a situation when smart cities had been discussed at the unit. However, the person stated smart cities had once been on the agenda during a business unit meeting, where the employees were shortly informed about an ongoing smart city project.

“Smart cities have not been a topic on any agenda at any meeting”.

- Employee, the Traffic Administration

In addition, during an observation one person expressed discontent about attending a smart city workshop, since the person felt smart city work was not a part of the person’s work. At another business unit one person stated that the co-workers and the manager of the unit were poorly informed about smart cities. At a third business unit one interviewee expressed that co-workers do not understand the smart city concept.

5.1.2.2.2 The structure of innovation processes

It is unclear among the interviewees if there are explicit innovation processes to follow as a guide and if so, which one to use. Four interviewees stated that there **exists formal processes or manuals** of how to implement new ideas; although three of them said they are **not used**. One person suggested this is probably due to employees not being aware of the processes existence or have not been educated about them. Meanwhile, three interviewees argued the City of Stockholm **does not have a structured way of capturing ideas** and **no formal process to manage** them. Furthermore, four interviewees discussed the **excess of administration** when implementing new ideas.

“The Traffic Administration does not have a structured way to capture ideas”

- Manager, the Traffic Administration

In addition, three interviewees felt the problem was **the lack of structure**. One of them mentioned that new ideas are explored and implemented randomly and occasionally. Two interviewees stated that few ideas are realized and nothing happens beyond talking. A third person suggested that new ideas are managed and implemented unnecessarily slow. Additionally, two interviewees thought there is a lack of consideration of new ideas in the organizational administration. For example, one of them mentioned that ideas are not acknowledged in the operational plans at the Traffic Administration. The other interviewee said the process from idea to implementation is long and both resources and budget have to be provided.

“New ideas, there is no management for that”... “...it has the organization never had.”

- Manager, the Traffic Administration.

The budget is set once a year, therefore there is no quick way to start the innovation process. In contrast, another manager argued that it is easy to secure resources. Finally, a manager argued the management of new ideas or innovation is a completely new topic for the Traffic Administration and the City of Stockholm, for example the city just instituted the position Director of Innovation.

In summary, the organizational and managerial challenges for internal involvement at the City of Stockholm were:

- Divided opinions about the management support
- Unclear directions of how the smart city strategy will affect the Traffic Administration
- Smart cities are discussed in specific groups
- Not all employees are involved in the smart city work
- Formal innovation processes exist but are not used
- Lacks structured process in idea management
- Excess of administration in idea development

5.1.2.3 Information flow and knowledge sharing

Different opinions were expressed regarding the absorption and dispersion of information at the City of Stockholm. Four interviewees said they spread information as a part of their work and two of them said it occurs on a regular basis. For example, one person mentioned that the person at times writes a newsletter to

share information to the business unit. Additionally, **four interviewees** argued the **information flow within the business units at the Traffic Administration is working well**. One person mentioned information spreading is a topic on the agenda at the employee's business unit meeting at the Traffic Administration. However, two of those who argued that information spreading occurs on a regular basis within the business unit, also stated that information regarding the **smart city is not spread at all within the business unit**. Another person suggested information from the Smart City Group might not be spread to others because there is an **uncertainty about to whom and what information should be spread**. Six interviewees argued there is **neither formal structure nor natural flow for spreading information** to co-workers. One person said information is spread randomly and occasionally. Another one has tried to spread ideas without success and has not heard a single idea about smart cities from the Traffic Administration lately. Ultimately, one person felt that employees at the Traffic Administration in general are poor at spreading information individually.

“It happens adhocly, there is nothing organized, but no one keeps the information”.

- Manager, the Traffic Administration

“There is no structure for it”.

- Employee, the Traffic Administration

Although there is no natural flow of information, **three interviewees** believed **no information is kept individually**, if one asks for it, it is given. Furthermore, two persons stated there is a pronounced culture of learning from each other meanwhile one said there is none. Moreover, one person did not know if there was a pronounced culture of learning, but had not received any information from another business unit and felt more information is spread than what comes back. Finally, one person stated that a common flow of information would be beneficial to find solutions with added value.

“I guess you have to self-criticize and say that we are bad at spreading information individually which we have acquired outside the organization”.

- Employee, the Traffic Administration

In summary, the organizational and managerial challenges for learning organization at the City of Stockholm were:

- Information is being spread on business unit level
- Smart city information is poorly spread
- Lack of formal structure and natural flow for information spreading
- No information is kept individually

5.1.2.4 Involvement of citizens

Nine interviewees out of ten said their respective business unit **does not involve citizens** meanwhile one person argued it does. During an observation it was clear that there was an **uncertainty** about **what the citizens' needs are**. One person claimed that the citizens do not know what they want and therefore there is no use in asking them. Instead of focusing on how to create value for the citizens, the main subject is finding what technology is the smartest from a technical point of view.

“Not in any other way except that we have them as an intended target group, but I have no contact with any citizen.”

- Manager, the Traffic Administration

“It is not like we meet them in everyday practice, I can't claim.”

- Manager, the Traffic Administration

According to **five persons**, the **main input from the citizens** to the Traffic Administration is through the portal “**Tyck till**” (Eng. “Make a suggestion”). One of them said angry citizens reach out to this person when they do not get an answer from anyone else in the organization about the complaints they have left in the portal. The person suggested the **procedures and processes** with regards to the portal are **poorly structured** and the information collected are not used nor analyzed in a proper way. Another one said the ambition is to decrease the amount of complaints and reporting errors. During an observation additional concerns about the use of the portal “Tyck till” was brought to attention. One said they were not prepared to deal with the amount of complaints and the requirements needed to complete the response process when the application was launched. Another person claimed the portal had only increased the workload.

“If Tyck till is not smart for the co-workers, it is not smart”.

- Employee, the Traffic Administration

In summary, the organizational and managerial challenges for customer participation at the City of Stockholm were:

- Citizens are not involved
- “Tyck till” gives the main input from citizens which is mostly complaints
- The procedures and processes connected to “Tyck till” are poorly structured

5.1.2.5 Integration and collaboration across the organization

The empirical data addressing the innovation management routine in collaboration focuses on two aspects; the degree of cross-functionality at the City of Stockholm and the level of flexibility in the organization structure.

5.1.2.5.1 The degree of cross-functionality

Several interviewees stated the importance of working cross-functionally when transforming into a smart city. However, **five of the interviewees** mentioned the **high presence of functional silos** at the City of Stockholm. Moreover, four of them commented specifically about the **functional silos within the Traffic Administration**. One of them said there is no insight between units. In general, one person said that the Traffic Administration has to be better at communicating what they do and their plans in short and long term. Furthermore, it would be beneficial if the units made their work, plans and ideas more visible to the management since the insights would be valuable for strategy and budget.

“...but now that we have started looking at smart city, you have a lot more interdependence and it becomes more complex. It is also one of our principles which we have stated in the strategy, that you should work across boards and think a bit broader.”

- Manager, the City Executive Office

Even in **smart city projects** one person believed the City of Stockholm is today **working in silos**. For example, four interviewees mentioned the **lack of insight into other smart city initiatives in other business units at the Traffic Administration**. Moreover, one person stated that it would be beneficial to work closer to and understanding other units to find synergies and to deliver added value. During an observation at the Traffic Administration the functional silos were discussed and the employees talked about aiming to work more cross-functional in general. However, it was clear the cross-functionality aim was restricted to only capture the Traffic Administration rather than involving the whole City of Stockholm.

Furthermore, **four interviewees** argued that the **work procedures** are a **fundamental aspect** to consider in a smart city. One person thought each unit could become smart on their own, but the city would not become truly smart until the different units in the city communicated. The person added that communication and interaction enable the city to solve problems that could not be solved before. In the same manner, another person believed that to be smart was to benefit from things in a more collaborative way to be able to succeed with things that were not possible before. A third person argued that it is about the organization, mindset and collaboration. Another topic that was discussed was added value and finding synergies. Two interviewees mentioned **added value** as **critical aspect** for a city to be smart. One person said, in smart cities there is a need to find added value to optimize solutions and thus use less resources. In summation, employees believe new work procedures are required in the smart city **to collaborate and find synergies.**

5.1.2.5.2 The level of flexibility in the organization structure

Three interviewees stated that the City of Stockholm is **hierarchical**. For example, one person argued that the implementation of the smart city strategy will take time, since there are **many levels** in the organization that need to understand and initiate projects. Another person stated that there are many levels in the hierarchy up to the City Executive Office.

In summary, the organizational and managerial challenges for collaboration at the City of Stockholm were:

- High presence of functional silos
- Functional silos in smart city projects due to lack of insight
- New work procedures for collaboration critical for smart cities
- The City of Stockholm is hierarchical with many levels

5.1.2.6 *Climate for innovation*

The empirical data addressing the innovation management routine creating a climate where ideas can flourish discuss the receptiveness of new ideas, the time set for new ideas and risk taking.

5.1.2.6.1 Perception of idea receptiveness

Reviewing the responses from **all ten interviewees** there is an agreement that **new ideas are generally well received and often appreciated** at the City of Stockholm. Although ideas are welcomed some believe the level of support differs. Three of the interviewees argued that the response to ideas depends on what level in the organization the idea is presented, whose domain the idea affect and the type of idea. Three persons suggested that **new ideas concerning technology are easier** to bring forward **than ideas** about **improving the**

organization. Two of them specifically stated that employees at the Traffic Administration want to be able to work in the same way, with the same work procedures, just adding some new technology. Two persons mentioned that **new ideas usually come from the people closest to the operations since they know the most about technology and maintenance.** In addition, one of them believed there is a lack of knowledge about the technology and maintenance among the managers.

The interviewees had different opinions about the employees' attitudes towards new ideas. One of the interviewees mentioned that **some people are negative** because they cannot see the value of the idea and that **some people are positive** because they believe beforehand, without knowing, that an idea brings a lot of value. Another person argued that the will to change in public organizations is greater than the general opinion believes. In addition, a third person in a manager position stated that it is not hard to anchor an idea, if there is a clear direction of where the Traffic Administration is heading with the idea. During the same interview, an example about a former employee at Traffic Administration was given. The employee brought forward lots of ideas, but when the employee left the organization the amount of new ideas decreased notably. Another manager stated it is hard to get an overview of all ideas at all units and the City Executive Office usually hears about them in a later stage.

5.1.2.6.2 Liberation of time and resources

Eight interviewees discussed the **lack of time** as a **problem when developing new ideas.** For instance, one manager mentioned that there is no time for ideas and the person usually do not come up with any. One interviewee started the process to develop an idea, but did not have the time for it to proceed. Three of them believed resources, specifically **time** and **budget, must be liberated** or set off for new ideas. For instance, a person had been invited to participate in a smart city activity, but the person had felt too stressed to become involved. Another person mentioned that consultants often have to be contracted to facilitate implementation of innovations or work procedures. Finally, a manager concluded that most co-workers at the City of Stockholm are heavily work loaded.

“...everyone is very heavily work loaded. In fact, we suck the most possible out of our employees.”

- Manager, the City Executive Office

“No resources are liberated, but it has to be accommodated for.”

- Employee, the Traffic Administration

5.1.2.6.3 Level of risk taking

The interviewees considered different sorts of risks when implementing new ideas. Six of the interviewees stated **financial risks** as a concern, although some were positive to taking small economical risks in small scale to learn. Two persons expressed concern about the budget and they felt controlled by the financial year. Another person thought it is sound to not spend tax money on ideas with an unknown result, but there must be a balance to allow new areas to be explored.

“The hardest thing is the time aspect. It is our budget year that has been very controlling.”

- Employee, the Traffic Administration

“Had we been a much smaller municipality, we might have dared to test more, or done more than we do”...” it’s more difficult when you initiate things because it costs more money and then you want to do the right investments.”

- Manager, the Traffic Administration

During an observation one person said the employees are not trained in creating new ideas. In addition the person mentioned there is a punishing culture at the Traffic Administration, where people avoid taking risks to not to make mistakes. In contrast, five interviewees argued there is an **allowance and an encouragement to test new ideas** at the City of Stockholm, although some felt that **the encouragement was not backed up with approval of resources**. One of them stated there are some areas that are taboo when testing new ideas, specifically concerning law and ethics. Additional risks that were brought up were losing the credibility, not taking standards and maintenance into account when implementing new ideas and jumping to solutions that are not fully anchored.

“...if you try nothing you don’t learn anything. That is supported now at least from the management”...”that we should try.”

Employee, the Traffic Administration

Furthermore, some of the interviewees expressed worries related to the City of Stockholm’s attempt to become a smart city. One person stated that there are two great risks with the transformation: the risk of not getting the co-workers on board with the transformation and the risk of creating a lot of platforms in parallel, making it expensive for the city. The same person argued that the smart city project is vast and large-scaled, meaning the consequences of making unwise

choices are many. Moreover the person believed it is important to stop or slow down when something seems to be going in the wrong direction. A manager was worried that employees are too eager to jump to solutions, implementing new technology or starting projects that are unnecessary.

In summary, the organizational and managerial challenges for creating a climate where ideas can flourish at the City of Stockholm were:

- Ideas are often well-received and appreciated
- Ideas concerning technology are easier to bring forward than ideas about organizational improvements
- Lack of time when developing new ideas
- Allowance and encouragement to test new ideas
- Worries about financial risks
- Risk taking not backed up with resources

6 Analysis

This chapter presents the analysis of the theory and the empirical data. It first discusses the organizational and managerial challenges and ultimately, the critical success factors for the City of Stockholm in managing towards a smart city.

6.1 Identifying the organizational and managerial challenges

In the previous chapter, the organizational and managerial challenges in innovation management were summarized for the City of Stockholm. This chapter is aimed at combining the empirical data, including the findings from both interviews and observations, with the theoretical framework to analyze the result. The chapter is divided into six parts, each part representing the organizational routines in innovation management discussed together with the smart city challenges to analyze the organizational and managerial challenges to consider in a smart city initiative. See Figure 6.1 for better understanding of the analysis structure.

| Theory | | Empirical data | | Analysis |
|-------------------------|-----------------------|---|---|---|
| Organizational routines | Smart city challenges | Organizational and managerial challenges in innovation management | → | Organizational and managerial challenges of becoming a smart city |

Figure 6.1 is showing the structure of the analysis for respective organizational routine.

6.1.1 Multiple visions of a smart city

In literature, many smart city definitions appear but there is not yet a common agreement of which one is the most accurate (Cocchia, 2014). However, Cocchia (2014) suggests three aspects are associated with a smart city: environmental, social and digital. From the findings in the empirical data, see Table 6.1 below,

different definitions of a smart city appeared. For instance, the digital aspect constituted the main part of the interviewees' definition, whereas social and environmental aspects were of less focus. The majority did not mention the citizens or the environment as part of a smart city definition. However, Hollands (2008) suggests the human and the social capital is the important aspect rather than completely relying on IT per se. Furthermore, there was only one person elaborating on the definition stated in the City of Stockholm's smart city strategy. Therefore, the employees at the City of Stockholm seem to lack a unified perspective of what a smart city is. However, according to Isaksen and Lauer (2002), a mutual agreement and a unified commitment to a vision is the essence of high performance (Isaksen and Lauer, 2002) and to change the status quo (Tidd, Bessant and Pavitt, 2005). Thus, not having a mutual perception about how a smart city is defined could limit the City of Stockholm's performance in its transformation towards becoming a smart city. As multiple or conflicting goals is a challenge for public actors in becoming a smart city (Chourabi et. al., 2012), multiple and conflicting definitions could pose an organizational and managerial challenge for the City of Stockholm in its work towards becoming smart.

One reason behind the divided smart city definitions could be the fact that the smart city strategy had been poorly communicated. Few participants in the interviews and observations were familiar with the content in the smart city strategy, in which the City of Stockholm's smart city definition and vision are stated. Can a transformation of this magnitude be successful without everyone knowing about the strategy and its components? In fact, involving several parts of the organization is a way to engage employees in the vision, mission and goals, which increase the level of commitment to the success of the organization (Tidd and Bessant, 2013). However, from the empirical data, interviewees had different perceptions of the level of participation in the smart city strategy development; some of them had been involved and some of them thought it were unclear who had participated in the development and how the strategy would be implemented. Employees at the City of Stockholm being involved in the development of the smart city strategy to different extents could imply different levels of commitment to the smart city transformation. Furthermore, the lack of clear vision of the management strategy poses a challenge for public actors in their transformation towards smart (Ebrahim and Irani, 2005). Therefore, the lack of knowledge about the smart city strategy and how the smart city strategy was developed or will be implemented could pose an organizational and managerial challenge to the success of the smart city.

Table 6.1 lists the organizational routine shared vision, the smart city challenges connected to shared vision and a summary of the findings in empirical data regarding shared vision.

| Organizational routines | Smart city challenges | Organizational and managerial challenges in innovation management |
|-------------------------|---|--|
| Shared vision | <ul style="list-style-type: none"> • Multiple or conflicting goals • Lack of normative drive in policy changes • Unclear vision of management strategy | <ul style="list-style-type: none"> • Different definitions of the smart city concept • Few mentioned the social aspect, citizens, and the environmental aspect as parts of the definition • Few were familiar with the content in the smart city strategy • Different perceptions of the level of participation in the smart city strategy development • The smart city strategy had been poorly communicated |

6.1.2 Engaging the employees and managers in smart city work

The organizational and managerial challenges concerning internal involvement found in the empirical data was analyzed by discussing the management support and the involvement in innovation at the City of Stockholm.

6.1.2.1 The need of management support

From the empirical data, see Table 6.2, two managers felt they had support from above, whereas the majority felt the management support was poor. Although, the support appeared to work well between politicians and top level management at the City Executive Office, the support from lower and middle level management at administrative and divisional level to business unit level was poor. As management support is a major challenge when it comes to smart city initiatives (Chourabi et. al., 2012), the lack of management support in the smart city transformation will pose an organizational and managerial challenge for the City of Stockholm. According to Niehoff, Enz and Grover (1990) the employees' degree of commitment to the organization depends heavily on the management's capability to generate a shared vision. Several participants in the interview and observations felt the strategy was poorly communicated and little of it was directed internally from the City Executive Office. For instance, many of them felt uncertain of how the strategy would affect the organization. As an unclear vision of the management strategy pose a challenge for public actors in their transformation towards becoming smart (Ebrahim and Irani, 2005), the unclear vision of the smart city strategy could pose an organizational and managerial challenge for the smart city transformation.

6.1.2.2 Unstructured and unconscious involvement in innovation

The level of involvement in innovation at the City of Stockholm was analyzed through the Five Stage High Involvement Innovation Model. The first stage in the model is characterized by having no formal structure to innovate and the involvement of employees occurs randomly (Bessant, 2003 cited in Tidd and Bessant, 2013). From the findings in the empirical data, see Table 6.2, it was evident that the City of Stockholm lacks structured processes and routines to capture and manage new ideas and when employees are involved in the innovation processes it happens occasionally and randomly. Additionally, innovation is not part of the operational plans at the Traffic Administration and there is no set visions or goals for new ideas. Moreover, it takes time to implement ideas and there is an excess of administration when doing so, probably explaining why few ideas are realized. In addition, since many employees at the City of Stockholm are heavily work-loaded, they will probably be less inclined to get involved in projects they feel are disconnected to their daily work.

To get to stage two in the model, the employees have to be educated in an official attempt to install formal innovation processes (Tidd, Bessant and Pavitt, 2001). However, the findings in the empirical data showed that formal process exist but are not used which could be due to employees not being aware of them or not being educated in them. To reach higher levels in the model, the overall strategy should be communicated and divided into manageable goals for each area in the organization. Moreover, performance measurement should also be in place to measure against the strategic goals (Bessant, 2003 cited in Tidd and Bessant, 2013). As of today, the City of Stockholm has no performance measurement set in place for the smart city strategy. Additionally, the overall smart city strategy has neither been clearly communicated nor been broken down into goals for each department. For instance, the Traffic Administration has initiated a few smart city projects but has yet to break down the vision, define their role and set specific goals of how they will contribute to the smart city. In summary, the discussed level of involvement in innovation suggest the City of Stockholm is currently at stage one in the Five Stage High Involvement Innovation Model, see Figure 6.2.

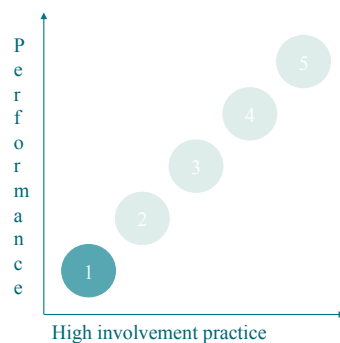


Figure 6.2 is showing the current position of the City of Stockholm in the Five Stage High Involvement Innovation Model.

Innovation is often viewed as processes only concerning special departments in the organization although all employees possess problem-solving abilities. Therefore, the innovative potential in the organization will be greater when involving all employees in innovative efforts (Tidd and Bessant, 2013). When implementing the smart city strategy, the City of Stockholm needs to consider how a low involvement in innovation could impact the performance. The City of Stockholm's low involvement could be due to innovation being viewed as a departmental-specific activity or the fact that innovation has historically not been in focus and is a new topic to the organization. In a smart city initiative, innovation is required in many areas (Naphade et. al., 2011). However, from the interviews and observations it was clear that only those involved in the smart city work discussed smart cities on a daily basis and of those not involved, smart cities were hardly discussed at all. Furthermore, some participants in the interviews and observations believed the smart city initiative did not concern their work and some do not understand the purpose of the smart city initiative.

According to Isaksen and Lauer (2002) involving employees in decision-making processes improves the possibility of implementing the decisions taken. Therefore, it would be beneficial for the implementation of the smart city, if the City of Stockholm would make a greater effort to further involve its employees in decision-making and implementation processes. In addition, the lack of involvement and participation is considered a challenge for public actors in smart city initiatives (Chourabi et. al., 2012). Consequently, the City of Stockholm is facing organizational and managerial challenges in not involving and making employees participating sufficiently in the work towards becoming the world's smartest and most connected city. Finally, the Traffic Administration has yet to break down the overall smart city vision into manageable goals although several smart city projects has been initiated. According to Chourabi et. al. (2012) the lack of alignment between the overall organizational goals and the projects is a challenge in smart city initiatives. Therefore, the lack of alignment between the overall smart city goals and the initiated smart city projects comprise an organizational and managerial challenge for the City of Stockholm.

Table 6.2 lists the organizational routine internal involvement, the smart city challenges connected to internal involvement and a summary of the findings in empirical data regarding internal involvement.

| Organizational routines | Smart city challenges | Organizational and managerial challenges in innovation management |
|-----------------------------|--|--|
| Internal involvement | <ul style="list-style-type: none"> • Involvement • Participation and partnership • Management support • Accountability and transparency • Lack of alignment of organizational goals and projects • Unclear vision of management strategy | <ul style="list-style-type: none"> • Divided opinions about the management support • Unclear directions of how the smart city strategy will affect the Traffic Administration • Smart cities are discussed in specific groups • Not all employees are involved in the smart city work • Formal innovation processes exist but are not used • Lacks structured process in idea management • Excess of administration in idea development |

6.1.3 Structure and routines to enable a learning organization

It is critical for an organization's survival to become a learning organization. In a learning organization information is continuously collected, spread and incorporated to help the organization adapt to an ever-changing environment (Garvin, Edmondson and Gino, 2008). The findings from the empirical data, see Table 6.3, showed that although information is shared at the City of Stockholm, it is limited and hard to access. For some interviewees it is part of their work and for some it occurs on a regular basis. In most cases it is an ad hoc and unstructured process. Furthermore, information is mostly shared within business units rather than spread across the organization. Several interviewees stated that no one is keeping information, if asked for information the information is accessible. Nevertheless, some interviewees felt they are spreading information but not receiving much in return. In particular, several interviewees stated information about the smart city work is poorly spread. Another indicator of the poorly spread smart city information, mentioned earlier, is the fact that few are familiar with the smart city strategy. However, the knowledge must be shared in a systematic and clearly defined way to guarantee effective and efficient information flows throughout the organization (Garvin, Edmondson and Gino, 2008). If there are no installed routines and the employees are not aware of how to spread information, it cannot be expected to occur which could indicate information is not effectively and efficiently spread at the City of Stockholm. Furthermore, the learning

orientation of an organization has great impact on an organization's innovativeness (Hult et. al., 2004). Since innovation is required in a smart city initiative (Naphade et. al., 2011), becoming a learning organization could be an enabling aspect for a public actor to become a smart city. However, according to Chourabi et. al. (2012) accessibility, communication and data-exchange are challenges a public actor faces when implementing a smart city initiative. Consequently, for the City of Stockholm to transform into a smart city, information must be continuously collected, spread and absorbed in a more structure way to ensure all information is accessible and utilized to optimize the learning within the organization. Therefore, an organizational and managerial challenge the City of Stockholm poses is the lack of structure for exchanging knowledge to enable a learning organization, which could have impact on the success of the smart city transformation.

Table 6.3 lists the organizational routine learning organization, the smart city challenges connected to learning organization and a summary of the findings in empirical data regarding learning organization.

| Organizational routine | Smart city challenges | Organizational and managerial challenges in innovation management |
|----------------------------------|--|---|
| The learning organization | <ul style="list-style-type: none"> • Accessibility • Communication and data-exchange | <ul style="list-style-type: none"> • Information is being spread on business unit level • Smart city information is poorly spread • Lack of formal structure and natural flow for information spreading • No information is kept individually |

6.1.4 Need for implementing routines to involve citizens

Literature reveals the importance of having a clear market orientation and involving customers at an early stage in the innovation process (Hult et. al., 2004). For the City of Stockholm, the intended target group is its citizens and the industry. However, the empirical data inclines, see Table 6.4, that historically citizens have not been involved in the development processes at the City of Stockholm. From interviews and observations, participants found it difficult to understand the citizens' needs. Instead the main focus has been finding the technology most suitable for the employees to make their work more efficient for the city. Since citizens have not been involved historically it could be difficult for the different departments at the City of Stockholm to know how to start involving them and how to approach them. For instance, the Traffic Administration gets its main input from citizens through the portal "Tyck till". However, the work procedures and processes connected to the portal are poorly structured, which have led to an increased workload. In addition, the input received is mostly complaints

from citizens. Together, this seems to have resulted in a negative attitude towards further involving citizens.

The involvement of lead users is particularly important in the development and adoption of complex products or services (Tidd, Bessant and Pavitt, 2005), such as those of a smart city initiative. In fact, smart city initiatives are intended to improve the life of the citizens (Capdevila and Zarlenga, 2015). However, historically, the initiatives have often been top-down without involving citizens in the decision-making or considering their opinions (Gascó, 2016). Citizens have been considered as users or testers rather than sources of creativity and innovation (Capdevila and Zarlenga, 2015). In contrast to prior work at the City of Stockholm, the smart city strategy explicitly stated that citizens were involved in the development. The City of Stockholm has also clearly stated the importance of collaborating with citizens, companies and other public actors to implement the smart city strategy. Chourabi et. al. (2012) argue that involving the industry, forming partnerships, educating the citizens and achieving citizen participation are challenges public actors face in a smart city initiative. The City of Stockholm’s aim to collaborate with its citizens could prove difficult for the organization, since it has no structure or routines in place. However, understanding how the citizens experience the City of Stockholm’s services could motivate the employees to improve them and lead to less uncertainty in large and complex procurements that span over a long period of time. One way of making citizens more involved at the Traffic Administration could be through advancements of the “Tyck till” portal since it is a direct link to citizens. The City of Stockholm could also find new ways of connecting to the citizens through different events where citizens can contribute with ideas.

In summary, the City of Stockholm will face organizational and managerial challenges in involving the citizens, incorporating their opinions and employing them as a source of creativity since historically the citizens have not been involved and thus there is a lack of structure and routines, which will have an impact on the city’s transformation in becoming smart.

Table 6.4 lists the organizational routine customer participation, the smart city challenges connected to customer participation and a summary of the findings in empirical data regarding customer participation.

| Organizational routine | Smart city challenges | Organizational and managerial challenges in innovation management |
|-------------------------------|---|---|
| Customer participation | <ul style="list-style-type: none"> • Involving the industry • Participation and partnership • Community gatekeepers • Education | <ul style="list-style-type: none"> • Citizens are not involved • “Tyck till” gives the main input from citizens which is mostly complaints • The procedures and processes connected to “Tyck till” are poorly structured |

6.1.5 Collaboration is key to innovation

Organizations that are hierarchical with high presence of functional silos are highly unlikely to be innovative (Tidd and Bessant, 2013). In addition, the lack of cross-sectorial cooperation and integration pose a great challenge to the success of a smart city initiative (Ebrahim and Irani, 2005). However, the findings in the empirical data, see Table 6.5, indicate that the City of Stockholm is hierarchical with many levels in the organization. Having these many levels could hinder information flows and idea initiation in the organization (Tidd and Bessant, 2013). Furthermore, there is a high presence of functional silos, which is present as well in the smart city work so far. This could be due to the lack of communication between the business units at the Traffic Administration, which could impose a major issue, because it prevents collaboration, finding synergies and delivering added value to the smart city.

The smart city strategy is an initiative from politicians and the City Executive Office and is being implemented top-down through the organization, which historically smart city initiatives have often been (Capdevila and Zarlenga, 2015). However, top-down communication can stifle innovation (Coe, Paquet and Roy, 2001), whereas a bottom-up approach involving the employees can smooth development and implementation processes (Isaksen and Lauer, 2002). Additionally, to manage unpredictable and complex assignments, organizational flexibility is critical (Tidd and Bessant, 2013). Rigid organizations have inferior innovation capabilities compared to flexible and adaptable organizations (Damanpoura and Gopalakrishnanb, 1998). Nevertheless, from the findings in the empirical data, allocating time and resources to new initiatives is taking both time and administration at the City of Stockholm. This, together with the indication that the City of Stockholm is a highly hierarchical organization with a high presence of functional silos, indicates that the organization is inflexible, which could hinder the organization's ability to innovate.

The presence of key individuals enables information flows in the organization, which is critical to innovation in the organization (Tidd and Bessant, 2013). Champions relentlessly promoting the smart city initiative are crucial to its success (Chourabi et. al., 2012). At the Traffic administration leaders of the Smart City Group has taken a role to advocate the smart city work. The group started without directives from the City Executive Office, when its leaders understood that the adopted smart city strategy would affect the Traffic Administration. On one hand, the Smart city group is composed by employees from different departments inducing a more collaborative and cross-functional approach with the aim of not only focusing on IT but rather the whole department of the Traffic Administration. On the other hand, the empirical data indicates there is lack of information shared from the Smart City Group to the business units at the Traffic Administration and so far smart cities are only being discussed in specific groups involved in smart city projects. Therefore, key individuals are greatly needed at the City of

Stockholm to create information flows that reach a larger audience and to relentlessly champion the smart city initiative.

In summary, the high presence of functional silos and the organization being hierarchical hinder cross-sectorial cooperation presenting an organizational and managerial challenge to the City of Stockholm, which it has to overcome to successfully transform into a smart city.

Table 6.5 lists the organizational routine collaboration, the smart city challenges connected to collaboration and a summary of the findings in empirical data regarding collaboration.

| Organizational routine | Smart city challenges | Organizational and managerial challenges in innovation management |
|------------------------|--|--|
| Collaboration | <ul style="list-style-type: none"> • Collaboration among stakeholders • Lack of integration skills and culture • Lack of cross-sectorial cooperation and interdepartmental coordination • Lack of integration across government systems • Leadership and champion | <ul style="list-style-type: none"> • High presence of functional silos • Functional silos in smart city projects due to lack of insight • New work procedures for collaboration critical for smart cities • The City of Stockholm is hierarchical with many levels |

6.1.6 A climate stifling innovation

6.1.6.1 The conflicting image of the idea receptiveness

It is important for an innovative climate to have high levels of trust and straightforward communication to ensure new ideas are well received and employees feeling comfortable with bringing forward new ideas (Tidd and Bessant, 2013). However, the statements from the participant in the interviews and the observation about the receptiveness of new ideas were conflicting, see Table 6.6. On one hand, interviewees stated that in general ideas are well received at the City of Stockholm. On the other hand, they suggested the level of support differed depending on the type of idea and whom the new idea would affect. For instance, ideas concerning implementation of new technology were generally more accepted at the City of Stockholm than ideas about changes in the organization, which is a recurring phenomenon in smart city literature as well. Hartley (2005) suggests innovation in technology is considered more tangible than, for example, changes in policies. In addition, resistance to change is a challenge public actors cope with when becoming smart (Chourabi et. al., 2012). However, interviewees indicated that there was some resistance to change among the employees at the City of Stockholm, since some employees wanted to work in the same way just adding

some technology. Consequently, the poor receptiveness in regards to ideas about organizational improvements and the resistance to change could impose organizational and managerial challenges to the City of Stockholm in its attempt to become smart since it affect the organization's ability to innovate.

6.1.6.2 The lack of time and resources to develop new ideas

Kanter (2013) emphasizes the importance of liberating time for idea development since it has an impact on the organization's innovativeness. However, the empirical data inclines, see Table 6.6, that the employees at City of Stockholm lack time and resources to develop new ideas, why consultants are often contracted. In addition, participants in interviews and observations felt they were heavily work loaded meanwhile they felt managers do not understand the amount of stress they are exposed to. Still, the implementation of the smart city strategy will require both time and effort. The City of Stockholm needs to consider how to make employees dedicate and liberate time for idea development and how to make employees less stressed. For instance, in the empirical data an interviewee had avoided participating in a smart city activity, because the person had felt too stressed. Therefore, it would be beneficial for the City of Stockholm to implement structures to liberate time and resources for the employees to develop new ideas, since stressed and heavily work loaded employees will avoid involvement in new projects and only be concerned with the daily task (Tidd and Bessant, 2013). The amount of stress the employees are exposed to is an issue in the smart city transformation since heavily work-loaded employees will be inclined to become involved in initiatives outside their daily tasks. This could pose challenges for the City of Stockholm when trying to involve its employees in the smart city initiative and when trying to generate innovation. Therefore, an organizational and managerial risk the City of Stockholm is facing in its attempt to become smart is the lack of structure for time and resource liberation in idea development which must be set in place for the City of Stockholm to become more innovative.

6.1.6.3 The impact of risk taking

The interviewees in the empirical data brought up several risks connected to innovation, see Table 6.6. Innovating and implementing new ideas are linked with risk (Tidd and Bessant, 2013), therefore, it is vital to have an organizational culture valuing calculated risk taking (Hogan and Coote, 2013). On one hand, the foremost concern was the financial risk because interviewees were apprehensive to spend tax money on uncertain results, which is a logical concern for a public actor. On the other hand, testing new ideas were encouraged in small scale to learn at the City of Stockholm, although, some interviewees felt that the encouragement was not backed up with approval of resources. However, encouraging the employees to experiment and to take risks is an organizational routine critical to innovation (Garvin, Edmondson and Gino, 2008). Financial risks were not the only concern, other risks mentioned were related to laws and ethics, losing credibility and not taking standards and maintenance into account. In addition, one participant in an

observation said there is a punishing culture at the Traffic Administration where people avoid taking risks to not make mistakes.

The interviewees mentioned two kinds of risks related to the smart city strategy. First, the risk of not getting the co-workers on board with the transformation and second, the risk of procuring different solutions in parallel solving the same problem and making it expensive for the city. In addition, the smart city project is vast and uncertain; therefore the participants in the interviews and observations expressed their worry about larger scale consequences. The empirical data also revealed a dilemma; the interviewees were worried about the consequences of making mistakes in smart city initiatives, whereas managers were worried about employees jumping to solutions and implementing new projects that are unnecessary. The smart city initiative involve profound change and innovation (Naphade et. al., 2001), why the City of Stockholm needs to have a more acceptable culture towards risk taking and embrace reasonable amount of uncertainties for the initiative to succeed. In fact, manager’s attitude and behaviors is one challenge associated with public actors working towards becoming smart (Chourabi et. al., 2012). Therefore, an organizational and managerial challenge for the City of Stockholm in its work towards becoming smart is changing the attitude towards risk taking by embracing it and allocating resources to initiatives with uncertain outcome such as those for a smart city to emphasize innovation in the organization.

Table 6.6 lists the organizational routine creating a climate where ideas can flourish, the smart city challenges connected to creating a climate where ideas can flourish and a summary of the findings in empirical data regarding creating a climate where ideas can flourish.

| Organizational routines | Smart city challenges | Organizational and managerial challenges in innovation management |
|---|---|---|
| <p>Creating a climate where ideas can flourish</p> | <ul style="list-style-type: none"> • Manager’s attitudes and behavior • Resistance to change • Politics and culture issues | <ul style="list-style-type: none"> • Ideas are often well-received and appreciated • Ideas concerning technology are easier to bring forward than ideas about organizational improvements • Lack of time when developing new ideas • Allowance and encouragement to test new ideas • Worries about financial risks • Risk taking not backed up with resources |

6.2 The critical success factors for the City of Stockholm to become smart

According to Chourabi et. al. (2012) there are eight critical success factors to consider to become a smart city; management and organization, technology, policy, built infrastructure, economy, people and community, governance and the natural environment. In order to investigate research question 2, the empirical data about City of Stockholm was evaluated based on the eight critical success factors to identify the important ones to consider when becoming a smart city. The factors are divided into inner and outer critical success factors (Chourabi et. al., 2012) and were analyzed in that order.

6.2.1 Evaluating the inner critical success factors

The inner critical success factors have greater, direct impact on the smart city initiative. The inner factors concern management and organization, policy and technology (Chourabi et. al., 2012). First, due to little prior research in management and organization for public actors (Chourabi et. al., 2012), the master's thesis aimed at discussing and identifying the organizational and managerial challenges, in the previous section. The challenges related to the lack of a shared vision, lack of internal involvement, lack of structure in information sharing and citizen involvement, presence of functional silos and rigid organization structures as well as aspects hindering innovation such as poor idea receptiveness, lack of time and resources and a negative attitude towards risk taking. Altogether, since the challenges discussed above have an impact on the success of the smart city implementation, management and organization is a critical success factor to the City of Stockholm.

Next, governmental innovation cannot succeed without changes in policy (Eger and Maggipinto, 2010 cited in Chourabi et. al., 2012). The City of Stockholm has formally adopted a strategy to become the world's smartest and most connected city. The strategy contains explicit principles, policies and a number of actions to enable the transformation towards becoming a smart city. The development process of the strategy was extensive, the City Executive Office involved the citizens, the industry and the organization to make a strategy well suited for the implementation of the smart city initiative (Stockholms stad, 2017h). Considering these aspects, the City of Stockholm seems to work actively with updating and innovating its policies why policy is a less critical factor to the success of the smart city transformation at the City of Stockholm.

Ultimately, technology is a central focus at the City of Stockholm and the city is taking an active role to be a digital forerunner (Stockholms stad, 2017h). For instance, the application "Tyck till" is an example of the public actor

implementing digital solutions. The City of Stockholm's definition of a smart city is a city that uses new technology to connect, simplify and improve the everyday life of the citizens and its visitors. In addition, the smart city strategy suggests new technology will act as an enabler through connectivity, open data, integrated platforms, sensors and other technology to continuously create new smart services (Stockholms stad, 2017h). From the findings in the empirical data, technology was the main aspect considered by the interviewees in the smart city definitions. In addition, it is generally considered easier to bring forward ideas concerning technology than ideas about organizational improvements. In summary, the critical success factor, technology, seems to be in place for the City of Stockholm in its work towards becoming a smart city.

6.2.2 Evaluating the outer critical success factors

The outer critical success factors for a smart city initiative are economy, governance, people and community, built infrastructure, and the natural environment (Chourabi et. al., 2012). First, the City of Stockholm has a built infrastructure with a well-developed fiber optic network and a broadband coverage well prepared for a smart city implementation. Moreover, Bronstein (2009) argues it is vital for a smart city to create an environment for business development. The City of Stockholm has a top ranked climate for start-ups, and the second highest amount of technical companies per capita in the world (Atomico, 2014), which is important since it triggers job and business creation as well as improved productivity (Chourabi et. al, 2012). Therefore, regarding both the critical success factors built infrastructure and economy, the City of Stockholm can be considered to have a satisfactory performance.

A public actor's governance should be founded on citizen involvement (Giffinger, et. al., 2007), has public and private partnership and its communication based on ICT (Odendaal, 2003). The City of Stockholm's work towards becoming a digital forerunner and the example of "Tyck till" suggests the city is working with digitizing its communication. Besides communicating digitally, citizens must take part in decision-making and implementation processes to succeed with a smart city initiative (Gascó, 2016). The City of Stockholm's citizens have a high digital maturity and access to open public data, which facilitates involvement and participation in the development of smart services (Håkonsson, and Obel, 2016). Although, the City of Stockholm did involve both its citizen and the industry in the strategy development, the findings in the empirical data suggest the organization has historically not involved the citizens and lacks routines to do so. In order to succeed with the critical success factor associated with people and community, the City of Stockholm must develop new processes to involve citizens on a regular basis. Moreover, the City of Stockholm cannot achieve satisfactory performance in the critical success factor governance until citizens become more involved even though communication based on ICT is partly in place. Regarding the final critical

success factor, natural environment, Giffinger et. al. (2007) suggests smart cities should be progressive regarding environmental issues and aim for being completely sustainable. In the City of Stockholm's vision to become smart, sustainability is a central concept (Stockholms stad, 2017) and the city is acknowledged as one of the most environmentally sustainable cities in Europe (European Commission, n.a.).

In summary, the City of Stockholm appears to have a favorable environment to become a smart city based on the performance in the critical success factors: economy, built infrastructure, policy, technology and the natural environment. In particular, the city has a well-developed infrastructure for ICT, is working towards becoming more digitized and has a flourishing business climate, altogether implying great potential to create new innovative solutions required in a smart city initiative. However, although ICT will act as an enabler in the smart city implementation (Cocchia, 2014; Paquet, 2001), using the technology will not make the city smart per se (Hollands, 2008). For a smart city the problem is not choosing what type of technology to use, but the challenge is to integrate it cross-functionally (Ebrahim and Irani, 2005). Altogether it sets new demands on the City of Stockholm as an organization. In particular, the City of Stockholm struggles to cope with the critical success factors: people and communities, governance and management and organization. These three factors are especially important for the City of Stockholm to acknowledge in its work towards becoming smart. Concerning management and organization several challenges were discussed. Management and organization is one of the inner factors, indicating it has a greater, direct impact on the success of the smart city initiative. Furthermore, the majority of the challenges linked with the eight critical success factors were also mainly organizational and managerial.

The main focus for the City of Stockholm must be to implement organizational routines and structure for enabling innovation. In particular, creating a climate where ideas can flourish and enhancing both internal and external involvement. First, routines enabling a climate where idea receptiveness is encouraged and supported at all levels, time and resources are liberated and a positive attitude is directed towards risk taking since these aspects emphasize innovation. Especially, since innovation has proved to play an important role in a smart city transformation. Next, working towards a learning organization implies acquiring and spreading knowledge, both through internal and external involvement. Internally, all employees possess creativity and problem-solving skills, and can therefore contribute with incremental innovations which could in total generate radical innovations necessary for the City of Stockholm to not only become smart and connected but a world leading one. Consequently, involving the employees to participate in the smart city work could accelerate the transformation. Additionally, the lack of shared vision at the City of Stockholm could lead to people working towards different goals, hindering collaboration and knowledge sharing and enforcing functional silos and hierarchy. Externally, involving the

citizens, valuing their opinions and viewing them as sources of creativity could lead to new and improved smart city services and less uncertainty in long-term and complex investments such as the ones the City of Stockholm is facing in its smart city transformation. Altogether, the performance in these organizational and managerial challenges will have an impact on the critical success factor management and organization. Coping with the organizational and managerial challenges could also lead to greater performance in the critical success factors governance and people and communities in terms of structure and citizen involvement. Therefore, management and organization is of particular importance to the success of the smart city transformation.

7 Conclusions

This chapter presents the conclusions of the master's thesis by answering the research questions. Contributions to academia and to practice are also given as well as further reflections and recommendations. Ultimately, suggestions for future research are presented.

7.1 Answer to research questions

The master's thesis was carried out to investigate two research questions. The answers to the research questions are presented below.

Research question 1: What are the organizational and managerial challenges of becoming a smart city?

The identified organizational and managerial challenges from the study are:

1. Multiple and conflicting smart city definitions
2. Lack of knowledge about the smart city strategy and how the smart city strategy was developed or will be implemented
3. Lack of management support
4. Unclear vision of the smart city strategy
5. Not involving and making employees participating sufficiently in the smart city work
6. Lack of alignment between the overall smart city goals and the initiated smart city projects
7. Lack of structure for exchanging knowledge to enable a learning organization
8. Lack of structure and routines for involving the citizens, incorporating their opinions and employing them as a source of creativity
9. High presence of functional silos and hierarchy
10. Poor receptiveness of new ideas and resistance to change
11. Lack of structure for liberating time and resource in idea development
12. Not embracing calculated risk and allocating resources to initiatives with uncertain outcome

Research question 2 was: Which are the important critical success factors for a public actor, like the City of Stockholm, in managing towards a smart city?

Although a public actor, like the City of Stockholm, has a favorable environment to become a smart city based on the performance in the critical success factors: economy, built infrastructure, policy, technology and the natural environment. There are three distinguishing critical success factors that must be in place:

1. Management and organization
2. People and communities
3. Governance

In particular, the critical success factor, management and organization should be considered. Firstly, since it has a great direct impact on the success of a smart city initiative and secondly, because the majority of the challenges linked with the eight critical success factors were mainly organizational and managerial. Altogether, the performance in management and organization could potentially lead to improved performance in the critical success factors governance and people and communities in terms of structure and citizen involvement. Therefore, management and organization is of particular importance to the success of the smart city transformation.

7.2 Contributions to academia and to practice

The master's thesis has fulfilled the purpose of contributing to academia and to practice. First, the managerial and organizational challenges were identified for a public actor in its transformation towards becoming smart. Next, three critical success factors were distinguished: management and organization, people and communities and governance, as especially important for a public actor in managing towards a smart city.

The findings contributed to academia in terms of identified organizational and managerial challenges since there is little research about organizational and managerial issues for public actor working towards becoming smart. Moreover, the findings of the master's thesis showed that public actors must have embedded organizational routines for innovation management, since innovation is required in a smart city initiative. Due to little research about innovation management in the public sector as well as for smart cities, the findings contributed to fill the gap in literature about innovation management's role in smart city transformations. The condensed theoretical framework, summarizing the organizational routines in innovation management and smart city challenges, can help public actors, similar to the City of Stockholm, to understand which organizational and managerial challenges poses a risk to the success of the smart city transformation.

The critical success factor, management and organization, was distinguished as important for a public actor trying to become smart. The involvement of citizens and industry appeared to have an accentuated significance in a smart city transformation. The aspect is highlighted in both the important critical success factors and the identified organizational and managerial challenges. Public actors, being aware of the critical success factors, could invest more effort into these areas and accelerate their transformation towards becoming smart.

The master's thesis contribution to practice was in terms of a better understanding of the organizational and managerial challenges the City of Stockholm is facing in its smart city work. The identified organizational and managerial challenges can help the organization to determine which areas to focus on and improve. In addition, the distinguished critical success factor can act as a guidance of how the organization must prioritize its work to achieve a successful smart city transformation.

7.3 Further reflections and recommendations

First, the amount of published material about smart cities has increased notably during the last couple of years, indicating a topic with a growing interest. However, there is still little research on the subject and about public actors in general. Furthermore, there is no existing smart city today, only cities trying to become smarter. Therefore, an extensive amount of different sources had to be used to understand the concept. Furthermore, the lack of literature made it difficult to understand what public actors must do to become a smart city and to encounter interesting articles discussing the matter. The lack of a clear definition of a smart city is problematic for researchers, but also for public actors. How can a public actor work towards becoming a smart city without a clear understanding of how it is defined?

Next, the transformation towards becoming a smart city is not easy. It requires innovation in many areas as well as employing new approaches to cope with the organizational challenges. However, assimilating and understanding the findings from the study could be considered as less of a challenge. For example, the City of Stockholm is aware of some of the challenges since they are acknowledged in the smart city strategy. Nevertheless, the real problem lies in overcoming the organizational and managerial challenges identified in the master's thesis and making a difference in the organization. The necessary changes are difficult to carry out in practice since they concern embedded routines and organizational culture, which take time and extensive work to develop. In fact, innovation management seems to be a difficult theme even for private actors and it is a significantly newer topic for public actors. Nevertheless, it is recommended that managers and employees at different levels of the City of Stockholm, as well as

other similar public actors, take these findings into consideration when working towards becoming smart.

Moreover, the organizational and managerial challenges and the important critical success factors were derived from a case study of the City of Stockholm. The study's findings can be applied to similar public actors wanting to transform into a smart city. However, other organizational and managerial challenges as well as critical success factors can probably be of importance to public actors of different character as opposed to the City of Stockholm. On one hand, not having the built infrastructure or the technology needed could pose challenges for public actors in becoming a smart city. On the other hand, a public actor with high performance in management and organization could possibly build its infrastructure thereafter. Altogether, there could possibly be other challenges and important critical success factors not considered in the master's thesis.

In addition, the smart city concept is new and the City of Stockholm's strategy was only recently adopted. In the City of Stockholm's vision to become smart the goal is set to be achieved in 2040. With this sort of long-term vision, the future smart city can be difficult to envision since the technology and the society will most likely have changed disruptively from now (2017) until then. At the same time, the author's believe the vision of the City of Stockholm to become the world's smartest and most connected city is an impressive one. Additionally, the authors feel inspired of the City of Stockholm's openness and drive to improve its organization and become a world leading one.

The case study was a cross-section of the City of Stockholm, implying the findings are applicable to the whole organization. However, it was not always easy to capture a justified picture of the whole organization. The City of Stockholm is a large organization with 40 000 employees and it was impossible to review all aspects and take in all opinions. Therefore, the authors were cautious to remain unbiased although it was difficult to assess all qualitative data.

7.4 Suggestions for future research

There is little research in the subject about smart cities and innovation in the public sector. Therefore, some suggestions for future research are presented. First, one subject that was discussed many times in the master's thesis was the involvement of citizens. Historically, the citizens have neither been involved in decision-making nor in the implementation process and public actors seem to lack routines for doing so. One suggestion for future research is therefore investigating how to involve citizen and which processes and routines are suited to a public actor to achieve this activity.

Moreover, the critical success factors to a smart city initiative discussed in the master's thesis was mainly derived from a framework developed by Chourabi et. al. (2012). However, there could be other frameworks or critical success factors to consider. Additionally, the smart city concept lacks a clear definition why measurements of how to determine the smartness of a city could be investigated. Another suggestion for future research could be to compare public actors of different sizes and character working towards becoming smart, to investigate if these factors have an impact on the outcome of a smart city initiative. For example, in the master's thesis, the findings could be applied to public actors similar to the City of Stockholm transforming into a smart city. However, it would be interesting to investigate if the findings in the master's thesis could be applied to other, not similar public actors, or if these public actors have other organizational and managerial challenges and important critical success factors to consider.

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Appendices

Appendix A – Interview guide

Appendix B – Project plan and outcome

Appendix A

The appendix presents the interview guide used in the master's thesis.

A.1 Interview Guide

We are writing a master's thesis about the City of Stockholm's work towards becoming a smart city in 2040. To be able to understand the work, a case study of the City of Stockholm will be conducted. We are interviewing you to understand the context in how the City of Stockholm is working with innovation management. Our ambition is to make a contribution to the work the City of Stockholm is doing towards becoming a smart city. The interview guide consists of 19 questions, which is estimated to take about one hour to carry out. The interview will be anonymous, but if allowed, it will be audio recorded.

A.1.1 Initial questions

1. What is your position and can you tell us shortly what you are working with?
2. How long have you had the position?

A.1.2 The vision of a smart city

3. What does a smart city means to you?
4. Are you familiar with the vision the City of Stockholm has set up regarding smart cities?

A.1.3 The level of internal involvement

A.1.3.1 Perceptions of management support

5. How does your manager handle new ideas?

A.1.3.2 Involved and structured innovation

6. Can you tell us about the last time smart cities were discussed in your business unit?
 - a. Officially/unofficially
7. Can you tell us about the process when you came up with an idea and the idea was passed on?
8. Is there a formal/specific process for development?

A.1.4 Information flows and knowledge sharing

9. Can you give an example of when you have spread information or insights to others in the organization?
 - a. From e.g. conference, supplier meeting, etcetera
10. Is there a pronounced culture of learning from each other and share information?

A.1.5 Involvement of citizens

11. Can you give an example of how you involve citizens in your work?
 - a. How are they in focus?

A.1.6 Integration and collaboration across the organization

12. Can you give an example of how another business unit than your own is working with...
 - a. ...smart cities
 - b. ...digitization
 - c. ...other example

A.1.7 Climate for innovation

A.1.7.1 Perception of idea receptiveness

13. How do you feel new ideas or initiatives are received at the City of Stockholm?

A.1.7.2 Liberation of time and resources

14. Do you feel there is time/space for new ideas?

A.1.7.3 Level of risk taking

15. Do you dare to take risks? Is there a culture of wanting to test new ideas?
16. What concerns you the most when you come up with new ideas or want to try a new solution?

A.1.8 Concluding questions

17. Is there something you would like to add that we have not asked you about?
18. If we have any additional questions, do you mind if we send you an email asking them?
19. Do you think there is someone else we should interview?

Thank you!

Appendix B

This appendix provides information about the intended project plan to follow during the master's thesis and the actual outcome.

B.1 Project plan

| Week | 23 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | |
|--|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|---|----|---|
| Activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | - | - | 20 | |
| Critical review of another master thesis | █ | | | | | | | | | | | | | | | | | | | | | | |
| Supervisor meeting | | █ | | █ | | | | █ | | | | █ | | | █ | | | █ | | | | | |
| Document defining the goals | | █ | █ | | | | | | | | | | | | | | | | | | | | |
| Project plan | | | | █ | | | | | | | | | | | | | | | | | | | |
| Literature review on theory | | | | █ | █ | █ | | | | | | | | | | | | | | | | | |
| Literature review on methodology | | | | | | █ | █ | █ | | | | | | | | | | | | | | | |
| Design observation method | | | | | | | | █ | | | | | | | | | | | | | | | |
| Design interview guide | | | | | | | | █ | | | | | | | | | | | | | | | |
| Data collection interview | | | | | | | | | █ | █ | | | | | | | | | | | | | |
| Data collection observation | | | | | █ | █ | | | █ | █ | | | | | | | | | | | | | |
| Transcribe and categorize empirical data | | | | | | | | | | | █ | █ | | | | | | | | | | | |
| Analysis | | | | | | | | | | | | | █ | █ | █ | | | | | | | | |
| Synthesis | | | | | | | | | | | | | | | | █ | █ | █ | █ | | | | |
| Hand-ins | | █ | | | | █ | | █ | | | | █ | | | █ | | █ | | █ | | | | |
| Presentation | | | | | | | | | | | | | | | | | | | | | | | █ |

B.2 Outcome

| Week | 23 | 34 | 35 | 36 | 37 | 38 | 39 | 40 | 41 | 42 | 43 | 44 | 45 | 46 | 47 | 48 | 49 | 50 | 51 | 52 | 1 | 2 | |
|--|-------------------|-------------------|-------------------|-------------------|-----------------------|-------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|-----------------------|----|---|----|-------------------|
| Activity | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | - | - | 20 | |
| Critical review of another master thesis | According to plan | | | | | | | | | | | | | | | | | | | | | | |
| Supervisor meeting | | According to plan | | Original plan | Not according to plan | | | Original plan | Not according to plan | | | Original plan | | | Original plan | Not according to plan | | According to plan | | | | | |
| Document defining the goals | | According to plan | According to plan | | | | | | | | | | | | | | | | | | | | |
| Project plan | | | | According to plan | | | | | | | | | | | | | | | | | | | |
| Literature review on theory | | | | According to plan | According to plan | According to plan | Not according to plan | Not according to plan | Not according to plan | Not according to plan | | | | | | | | | | | | | |
| Literature review on methodology | | | | | | According to plan | According to plan | According to plan | | | | | | | | | | | | | | | |
| Design observation method | | | | | | | | According to plan | | | | | | | | | | | | | | | |
| Design interview guide | | | | | | | | | According to plan | According to plan | Not according to plan | Not according to plan | | | | | | | | | | | |
| Data collection interview | | | | | | | | | According to plan | According to plan | Not according to plan | Not according to plan | | | | | | | | | | | |
| Data collection observation | | | | Original plan | According to plan | | | | According to plan | Original plan | | | | Not according to plan | Not according to plan | | | | | | | | |
| Transcribe and categorize empirical data | | | | | | | | | Not according to plan | According to plan | According to plan | Not according to plan | Not according to plan | Not according to plan | | | | | | | | | |
| Analysis | | | | | | | | | | | | | Original plan | Original plan | Not according to plan | Not according to plan | | | | | | | |
| Synthesis | | | | | | | | | | | | | | | | Not according to plan | Not according to plan | Not according to plan | Not according to plan | | | | |
| Hand-ins | | According to plan | | | | Original plan | Not according to plan | According to plan | | | | Original plan | | Not according to plan | Original plan | Not according to plan | Original plan | Not according to plan | Not according to plan | | | | |
| Presentation | | | | | | | | | | | | | | | | | | | | | | | According to plan |

The outcome of the project plan shows that not all activities went according to the plan. In particular, the literature review on theory took longer time than expected, since the iterative process applied in the master's thesis required the theory to be continuously updated. The interviews were conducted during two additional weeks due to cancellations, why new participants were recruited. Designing the interview guide was carried out iteratively simultaneously as the interviews were conducted. Consequently, designing the interview guide took two extra weeks as well. The categorization of data was more difficult than expected and, therefore, was carried out over a longer period of time. The remainder went mostly according to plan.