I am SMARTerdam
Reevaluating the Smart City concept through the world’s most bottom-up Smart City

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June 2018

Radboud Universiteit Nijmegen
TITLE: I amSMARTerdam – Revaluating the Smart City concept through the world’s most bottom-up Smart City

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JOINT EUROPEAN MASTER’S PROGRAM PLANET EUROPE
European Spatial Planning & Regional Development

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WORD COUNT: 21,782 (Excluding tables and figures)
Abstract

Smart Cities are, while hot-and-happening, in the field of urban planning, also a source of confusion and debate. While many argue against the technology-driven and top-down nature of the Smart City model, the bottom-up component is often appointed as the deciding factor in the determination whether a Smart City can be successful and contributing to its set goals, or rather resulting in an effort harming the city and its citizens in the long run. This thesis set out to explore the bottom-up component in one of the most revered and most bottom-up Smart Cities of the world, Amsterdam. Remarkably, the research has proven that Amsterdam Smart City, even though it is often seen as one of the good examples, suffers from the same issues. Its initiatives are an amalgamation of subjects that hardly seem to fit under the smart narrative as propagated by Amsterdam Smart City and hardly any initiatives can be considered truly bottom-up. If one of the prime examples fails to adhere to its own standards, what does this mean for the concept of smart cities?
Preface

Dear Reader,

Hereby I would like to welcome you to my Master Thesis that is part of the Master PLANET Europe (Or European Spatial Planning and Regional Development) at Blekinge Tekniska Högskola and Radboud Universiteit Nijmegen.

This document is the culmination of several months of work in a process that started to slowly get going somewhere during my final weeks in Antwerp, and, coincidentally, ends in the very same room I wrote my very first paper during my bachelor, at Utrecht University. The process has been a difficult one, with a slow start and changing directions, and a sudden shift in methods that in the end may not have been as beneficial as I had hoped, but alas. I am convinced however that the findings in this document will contribute to both academics and those working with Smart Cities in their daily endeavours. Without further ado, I would like to express my gratitude to those who contributed to the entire journey that PLANET Europe has been for the past two years.

First, I would like to thank my supervisors, Jan-Evert Nilsson and Peter Ache for supporting me and guiding me throughout the thesis trajectory. I enjoyed our discussions very much and felt that the meetings we had have been a major contribution to finding my way in this subject. I believe the different backgrounds we all have and the different ways we perceive Smart Cities and the surrounding subjects have enhanced my thesis.

Second, I would like to congratulate all my fellow PLANET Europe students for their achievements and wish them the very best in their career. I can wholeheartedly say that over the past two years we’ve grown into more than just academic peers, and I very much appreciate that which we’ve built during these times. I’m very glad we had the opportunity to visit Cardiff, and that you guys were all in Karlskrona, so we could experience the situation in which each of us spent their second semester. I’d like to specifically thank Karina and Sindi for making the Karlskrona experience a very special one. I’m glad we spent the semester there together, and I think we managed to “survive” that semester thanks to the three of us being there together.

Continuing the Karlskrona semester, I would like to thank everyone that spent the spring semester in Karlskrona. I’m not joking when I say that this has been one of the friendliest groups of people I have been around, and without these people it would not have been the same. Then, I’d like to thank Jan-Evert Nilsson again, for taking the time to lecture us, every day of the week. I’m sure it wasn’t always as nice to give lectures to a very limited (sometimes shrinking) group of students, but you have been there for us every single day for four months. Furthermore, I’d like to thank Sabrina Fredin for the efforts she put in for us, both during the semester in Karlskrona as well as the Intensive Seminar. I believe you were a bit surprised when you were appointed as the “person in charge” for PE for the remainder of the program, but I have to say hats off to your performance. You did better than I would have been able to imagine, and made our progress in Karlskrona a smooth one, while doing your own PhD work on the side. And you had the pleasure of entertaining us during the afternoon seminars every day. I’m sure those seminars weren’t the thing you looked forward to most each day, but they contributed to our understandings and even though we didn’t always show, we appreciated your efforts.

Then, I’d like to thank every single person that has (at one point) been working with or for the PLANET Europe program. While at times it has been confusing and perhaps even frustrating for some, I personally believe every single individual involved with the program did their absolute best to accommodate us with whatever requests or questions we had. I would like to acknowledge these
efforts, and thank everyone, for the interesting lectures and presentations, but also the many things that have been going on behind the scenes.

Finally, I’d like to thank my friends and family for their continuous support, being there for me whenever I needed them, even though half of the time I wasn’t in the country to be there for them. Specifically, I’d like to thank Tom and Malou, for being an inspiration to me every day, and for giving me something to look up to. In some ways, I tried to copy what you did before me, and that led me to go to university and explore the world. Without those good examples, I’m not sure where I would have gone, but the chances that I’d end up right here are slim. Then, I’d like to thank my parents, Ed and Hanneke, for their support and love. Where Tom & Malou offered me inspiration, you encouraged me to follow this inspiration, and to experience and explore as many things as I could. Besides firing up the desire to see the world and ultimately pursue my masters outside of the Netherlands (albeit partially), there was always a warm and cosy place to come home to. Finally, I’d like to thank Linda, for always being there for me and being supportive of what I chose to do, even though that meant us being separated for almost more time than we’ve been together.

Sincerely,

Lucas
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Chapter 1: Introduction

1.1 Introduction
Modern day cities are complex system characterised by large numbers of citizens, businesses, modes of transportation, communication networks, services and institutional organizations (Neirotti et al., 2014). The rapid growth and urbanization of cities has led to an increase of congestion, pollution, social inequality among other issues (Neirotti et al., 2014; Albino et al., 2015). Within this context, a debate has emerged within which technology-based solutions are the supposed key to dealing with these challenges (Neirotti et al., 2014). The concept of Smart Cities has materialized and been in the centre of attention in the field of urban planning (Caragliu et al., 2015).

However, this approach is not one without controversy. In fact, the very concept of Smart Cities appears to be vague, and there is still no consensus on what a Smart City is, or what can or cannot be attributed to this concept (Fernandez-Anez et al., forthcoming). While technology is seen as a main driver for smart cities, Neirotti et al. (2014) note that ICT-based solutions are but one of many input resources for projects that aim to improve daily urban systems. Continuing along this note, Neirotti et al. (2014) state that the number of smart initiatives launched by a city are not a performance indicator, and that cities driven by technology are not necessarily better cities.

Besides criticizing the rather vague notion of this concept, many have taken up arms against the various ways it expresses itself too. Hollands (2008) is perhaps the most famous antagonist and warned that the Smart City approaches being implemented were far from the medicine that they were being pushed as. Many others have joined Hollands in a plea for more inclusive and effective smart cities, where citizens and the urban issues at stake are the drivers for development, rather than corporate gains or technology-push.

1.2 Introduction to the problem definition
The possible explanations for failing Smart Cities vary significantly. Some, like Hollands (2008) or Capdevilla & Zarlenga (2015) blame the hollow concept of smart cities. Cities often claim to be smart but fail to address what this means or to offer evidence that supports these claims (Hollands, 2008). While cities enjoy being “smart” and regarded as “smart”, they often fail to convey what this means, and why it is so important for them to be smart (Ibid.). The claim to be smart must be based on more than just the application of technology, according to Hollands (2008). Without a defining notion, the idea of a smart city emphasizes business-led development, and businesses have seen the opportunities where cities are struggling to develop a solid smart city concept (Capdevila & Zarlenga, 2015). As a result, firms are actively looking to strengthen their relationships with cities, to spread their influence and to gain from these initiatives in a commercial sense, while the city faces potential risk as it moves away from policies based on demand-pull (Ibid.).

Others blame the “hype” surrounding Smart Cities, with the pressure to become a “smart city” or to score in “smart city rankings”, leading to incoherent concepts which adhere to rankings and measurements, rather than actual needs (Glasemeier & Nebiolo, 2016). Furthermore, the role of citizens and their needs in the decision-making process seems to be, while often mentioned as a goal for smart programs, diminishing rather than increasing (Angelidou, 2017).

The future of successful smart cities, is, according to many, in the strengthening of the bottom-up component of Smart Cities. By giving those who live and breathe in the city the rights to own the city, pitfalls such as those mentioned above could potentially be avoided.
1.3 Problem definition & research question

Within the academic field of smart cities, very little attention is being paid to the bottom-up component of smart cities, and those who do speak about this (to some) critical component often fail to provide a thorough explanation of what exactly comprises of such a bottom-up component. This master thesis seeks to enhance the societal and academic understanding of the influence of bottom-up initiatives on smart cities through the case study of Amsterdam. Therefore, the following research question has been developed:

“To what extent is Amsterdam Smart City shaped by a bottom-up component, and do these bottom-up initiatives play a pivotal role in the concept?”

This main research question does imply several other questions, such as:

1. What exactly entails a Smart City?
2. What makes up the bottom-up component?
3. When can initiatives be considered bottom-up?
   a. According to the literature
   b. According to the Amsterdam Smart City concept
4. What contributions does the bottom-up component deliver to Amsterdam Smart City?

To answer the main research question, the attention will be placed upon bottom-up initiatives in the city of Amsterdam as informants. These initiatives are operating within different fields and vary in both size and goal but have in common that they are contributing to the developments in Amsterdam Smart City [ASC].

This research environment has been chosen for its relevance in answering the research question due to the recent criticisms on the Smart City concepts, to which often a bottom-up component is offered as a solution. By analysing the Amsterdam case, the author hopes to contribute to both the understanding of bottom-up components in Smart Cities from an academic perspective, as well as to directly provide insights in the functioning and performance of Amsterdam Smart City, and potential pitfalls for this much revered example.

1.4 Research objectives

Requirements contained in this section: Aims & Objectives of the work

This paper aims to contribute to the field of Smart Cities. Prior studies have provided valuable insights in the various (theoretical) Smart City concepts and the potential pitfalls associated with Smart Cities. Several authors have pointed towards (the introduction of) a bottom-up component to counter or circumvent some of these issues. However, while some have appointed the bottom-up perspective as a critical component of Smart Cities, very few authors have described what this bottom-up component should be comprised of, or how it appears outside of theoretical concepts. Therefore, this master thesis seeks to bridge the described gap by enhancing the academic knowledge about the bottom-up component of Smart Cities and their impact on the Smart City discourse.

The priorities as identified by ASC will be identified through an analysis of all projects initiated and/or endorsed by ASC and to which urban issues these cater. Moreover, these projects will be “checked” to see to what extent they are: 1) bottom-up initiatives; 2) smart projects according to the definition set by Amsterdam Smart City and 3) whether these projects are in line with the goals set by ASC. These outcomes will provide an evaluation of the Amsterdam Smart City and both the “smartness” of this approach according to their own definition, as well as an overview of how bottom-up the ASC approach is, and whether there is coherence between the bottom-up views and the top-down discourse.
1.5 Research design

For the analysis of the Amsterdam Smart City and its bottom-up component an inductive research approach will be used. This will be done by conducting an exploratory interpretative qualitative research. It will be a case study research design that uses an extensive analysis of 254 initiatives that are linked to the Amsterdam Smart City concept, as well as 43 initiatives that are not associated with ASC, but have been described as bottom-up initiatives which are active in the municipality of Amsterdam.

In the first phase of this research, an extensive literature review will be conducted. Departing from the emergence of Smart Cities, the fuzzy concept of smart cities will be explored, within which key concepts that make up a Smart City will be identified. These key concepts, alongside an exploration of real-life applications of Smart Cities, coupled with the many critiques on this concept, will lead to the conception of a conceptual model. In the second phase of the research process, it is key to prepare a case study on Amsterdam, in which it is key to develop a projection of potential urban issues which Amsterdam may face which will be done through both literature review as well as consultation with initiatives in Amsterdam.

In the extensive analysis that follows, more than 250 cases will be individually assessed to determine whether they are in line with the goals set by Amsterdam Smart City, whether they can be regarded as true smart city initiatives, and whether these initiatives can be considered bottom-up. This approach will result in valuable insights in answering the main research question. As a result, all the information collected will be enabling to construct a framework which indicates the extent to which bottom-up initiatives are present in Amsterdam Smart City, and whether they play a pivotal role in the success of this smart city concept.
2. Literature Review

The literature review for this research thesis departs from the emergence of the concept of Smart Cities. Why is it such a hot topic, and to what means is it being applied in cities all over the world? This section is followed by an introduction to the fuzzy concept of Smart Cities in section 2.2. Section 2.3 tries to unravel this fuzzy concept and delves into the contents of a smart city, and how the components and characteristics of a Smart City are related. Section 2.4 gives an example of “real” smart cities, and as such serves both as an insight in applied Smart Cities, rather than just the theoretical concept, as well as an introduction to section 2.5, which constitutes of the criticism on smart cities. Some authors argue that this criticism provides proof for the need of a bottom-up component in Smart Cities, and section 2.6 portrays the possibilities for bottom-up in a smart city. Finally, section 2.7 will serve as a linkage between the identified necessity for a bottom-up component in a smart city, and the “composition” of a smart city as described in section 2.3.

2.1 Introduction

During the last ten to twenty years of the 20th century, two important phenomena have rapidly become more important: urbanization and information and communication technologies (Cocchia, 2014). The technological advancements and economic growth of the ‘80s and ‘90s contributed to an increased well-being, mainly located in urban centres (Ibid.). This fostered further urbanization leading to a progressive abandoning of rural areas in favour of cities and metropolitan areas (Ibid.). By 2050, up to 70% of all people will be living in cities (Hajer & Dassen, 2014). The strong inclination to concentrate in cities produced both positive and negative effects at global scale as cities play a major role in social and economic aspects worldwide and have a large impact on the environment (Albino et al., 2015). Due to the aforementioned “flocking towards the city”, cities nowadays consume between 60 percent to 80 percent of energy worldwide and are responsible for a large amount of the greenhouse gas emissions (Ibid.). This scenario calls for action as cities require ways to manage new challenges, such as transportation linkages, mixed land uses and high-quality urban services (Ibid.). Confronted with these challenges, this sprouted a need for new concepts, and many cities have found in smart initiatives a strategic option to pull out from present and future problems by heavily investing in technology-oriented solutions (Fernández-Güell et al., 2016). This notion has gained much traction among policy makers, researchers, and the private sector (Caragliu et al., 2015). Many of the new approaches related to urban services have been based on adopting technology to help create “Smart Cities” (Albino et al., 2015). The increasing scale of cities and their rising political and economic importance call for these smart cities which can cope with both local and global challenges and which are able to employ the available resources in a way that maximizes both welfare and sustainable growth (Caragliu et al., 2015).
2.2 The fuzzy concept of Smart Cities

The profile of Smart Cities has, in recent years, become an interesting research topic concerning various disciplines, from economics to smart urban architecture and from smart technological development to globalization (Caragliu et al., 2015). The concept of a smart city is more than merely the application of technology to cities, as in fact the concept is booming in many sectors, without there being a clear-cut agreed upon definition (Albino et al., 2015). A range of conceptual variants exists in which “smart” is replaced by alternative adjectives such as “intelligent” or “digital”, and often these are used interchangeably, borrow one another’s assumptions, or get conflated together (Albino et al., 2015; Hollands 2008). As a result, “smart city” is a fuzzy concept, which is used in ways which may not always be consistent and there is neither a single template of framing a smart city nor a one-size-fits-all definition of the concept (Albino et al., 2015). A clear and sound definition of a smart city thus lacks, not only in academic studies, but also in empirical applications of smart concepts (Dameri, 2013). Therefore, it is important to underline that there is no static “Smart City” concept and the concept has been evolving since its first use (Caragliu et al., 2015). Table 1 shows an overview of some of the definitions used by various authors.

According to Albino et al. (2015) the term “smart city” was first used in the 1990s and at that time, the focus was on the significance of (relatively) new ICT especially regarding modern infrastructures in cities. The Center of Governance at the University of Ottawa criticized the idea of a smart city being too technically oriented and proposed that the smart city should have a strong governance-oriented approach which emphasizes the role of social capital and relations in urban development (Ibid.). However, the smart city label diffused in the first years of the new century as an “urban labeling” phenomenon (Albino et al., 2015), perhaps best described by the following “definition”: “The term Smart City is basically and evocative slogan lacking a well-defined conceptual core, and, in this sense, proponents of the smart city can use the term in ways that support their own agenda” (Vanolo, 2013, p. 884).
<table>
<thead>
<tr>
<th>Definition</th>
<th>Source</th>
<th>Focus</th>
<th>Bottom-up?</th>
</tr>
</thead>
<tbody>
<tr>
<td>“We believe a city to be smart when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance”</td>
<td>Caragliu et al., 2011.</td>
<td>Integrated</td>
<td>Participation</td>
</tr>
<tr>
<td>“A Smart City is a city well performing built on the ‘smart’ combination of endowments and activities of self-decisive, independent and aware citizens”</td>
<td>Giffinger et al., 2007</td>
<td>Integrated</td>
<td>Participation</td>
</tr>
<tr>
<td>“The term Smart City is basically and evocative slogan lacking a well-defined conceptual core, and, in this sense, proponents of the smart city are allowed to use the term in ways that support their own agenda”</td>
<td>Vanolo, 2013.</td>
<td>n/a</td>
<td>-</td>
</tr>
<tr>
<td>“Specifically, we define the smart city as cutting-edge urban development strategy that contributes to urban sustainability”</td>
<td>Mosannenzadeh et al., 2017.</td>
<td>Institutional</td>
<td></td>
</tr>
<tr>
<td>“This research understands the Smart City as an integrated and multi-dimensional system that aims to address urban challenges based on a multi-stakeholder partnership”</td>
<td>Fernandez-Anez et al., forthcoming</td>
<td>Integrated</td>
<td>Places citizens at the center of its model</td>
</tr>
<tr>
<td>“The smartness of a city refers to its ability to attract human capital and to mobilize this human capital in collaborations between the various (organized and individual) actors through the use of information and communication technologies.”</td>
<td>Meijer &amp; Rodríguez Bolivar, 2016.</td>
<td>Integrated</td>
<td>Emphasizes the need for a bottom-up component in smart cities</td>
</tr>
<tr>
<td>“A smart city is a well-defined geographical area, in which high technologies such as ICT, logistic, energy production, and so on, cooperate to create benefits for citizens in terms of well-being, inclusion and participation, environmental quality, intelligent development; it is governed by a well-defined pool of subjects, able to state the rules and policy for the city government and development”</td>
<td>Dameri, 2013.</td>
<td>Integrated</td>
<td>Requires an active role for citizens in participating in the city governance.</td>
</tr>
</tbody>
</table>
“A Smart City is an integrated system in which human and social capital interact, using technology-based solutions. It aims to efficiently achieve sustainable and resilient development and a high quality of life on the basis of a multistakeholder, municipality-based partnership.”

Monzon, 2015. Integrated

“multi-stakeholder municipally-based partnerships” and “bottom-up approaches ought to be allowed to coexist with the more traditional top-down ones”.

“We conceive Smart Cities as those innovative urban systems that strategically invest in new technologies and human capital, seeking to improve services effectiveness, quality of life, economic competitiveness, environmental sustainability, and participatory governance.”

Fernández-Güell et al., 2016. Integrated

“stakeholders’ involvement during the entire process is a critical element of the proposed approach”

“Smart city is a wired urban space aiming at implementing digital data, services and communication and clean infrastructures, to improve the quality of life in the city through a large web connection and a reduced environmental footprint”

Dameri, 2017. Integrated

None mentioned in the definition, however, Amsterdam Smart City is referred to as a good example of best practices involving citizens in smart projects, and by doing so increasing democratic participation.

“A Smart City is a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipality based partnership”

Manville et al., 2014. Integrated

Source: Compiled by author.

2.3 Smart Cities – What constitutes of a Smart City? Making sense of the various uses of “Smart City”

Nam & Pardo (2011) discussed the difference between the concept of smart city and related terms such as the digital, ubiquitous, or intelligent city, and found that a variety of these labels can be categorized in three dimensions: technology (infrastructures of hardware and software), people (creativity, diversity, and education) and institution (governance and policy). Nam & Pardo (2011) join in with an earlier version of the definition of smart cities that Caragliu et al. (2011) used and state that given the connection between technology, people and institution, a city is smart when investments in human and social capital and IT infrastructure fuel sustainable growth and enhance a quality of light through participatory governance. Nam & Pardo (2011) are not the only authors that studied articles on smart cities and how these are defined. Meijer & Rodríguez Bolívar (2016) analysed 51 articles on
smart cities and found a similar classification, with smart cities as using smart technologies (technological focus), smart cities as cities with smart people (Human resource focus) and smart cities as cities with smart collaboration (governance focus), and finally combinations of the three components. Figure 2 shows how Nam & Pardo (2011) envision these components and which “alternative adjectives” can be classified under each of these components.

Figure 2: Components of the Smart City

![Components of the Smart City](image)

Source: Nam & Pardo, 2011.

2.3.1. Exploring the three components – Technology

While technology is key to being a smart city because of the use of ICT to transform life and work within a city, a well-functioning infrastructure is necessary but not enough to become a smart city (Nam & Pardo, 2011). IT infrastructure and applications are prerequisites, but should be regarded a tool, as ICT and its applications are there to facilitate involvement of all parties in the development of the smart city (Lindskog, 2004). Without real engagement and willingness to collaborate and cooperate between the private sector, citizens and public institutions, there is no smart city (Ibid.). This nuance is however not present in all papers. Most studies on practices of smart cities address issues of technological infrastructure and enabling technologies, the focus on which stresses accessibility and availability of systems (Nam & Pardo, 2011). The key feature of the technological component is that technology forms the starting point for rethinking all other issues, such as the role of creative industries in urban growth, the importance of social capital in urban development and urban sustainability (Meijer & Rodríguez Bolívar, 2016). Mobile, virtual, and ubiquitous technologies gain importance as they offer benefits to city dwellers in mobile lifestyles as the application of smart cities evolves from smart places to networked inhabitants (Nam & Pardo, 2011). Finally, to conclude the technology component, Nam & Pardo (2011) state that the smart city provides interoperable, Internet-based government services that enable ubiquitous connectivity to transform key government processes, both internally across departments and employees and externally to citizens and businesses.
2.3.2 Exploring the three components – Human factors
As Lindskog (2004) explained, the smart city is not only defined by the availability and quality of IT services. Her explanation as well as other definitions stress the importance of human infrastructure, human capital, and education in urban development (Nam & Pardo, 2011). Addressing the topic of people as a part of smart cities is critical and has traditionally been neglected on the expense of a more technological or policy focused approach to smart cities (Chourabi et al., 2012). It is critical to not refer to members of the city only as individuals, but also as communities and groups (Ibid.).

From this perspective, problems associated with urban agglomerations can be solved by means of creativity, human capital, cooperation among relevant stakeholders and their (scientific) ideas (Nam & Pardo, 2011), or as Caragliu et al. (2011) call it “smart solutions”. Therefore the category of human factors highlights creativity, social learning and education and the label smart city from a “human component” points towards clever solutions by creative people (Nam & Pardo, 2011).

Education, according to Nam & Pardo (2011) is a critical magnet that makes cities attractive, and collective intelligence and social learning makes a city smarter in their view. Smart cities are conceptualized as small and mid-sized metropolitan areas with a large share of the adult population with a college degree, and the concept of smart city in this strand is mainly built on the characteristics of smart inhabitants, in terms of their educational grade, and this level of education is seen as the main driver of economic growth (Meijer & Rodríguez Bolívar, 2016). Opinions on the reasons for having a highly educated population differ, as some argue that an educated population moves to cities with a high quality of life whereas others state that students simply stay in the city after they finish their education (Ibid.). The notion of a smart community, a term which Lindskog (2004) talked about, is by account of Nam & Pardo (2011) referring to the locus in which networked intelligence is embedded and continuous learning is nurtured, and a smart city initiative becomes an integrated approach to connecting among communities, creating specific services to address city objectives and problems, and to advance collective skills and capabilities.

2.3.3 Exploring the three components – Institutional factors
The support of government and policy for governance is fundamental to the design and implementation of smart city initiatives (Nam & Pardo, 2011). The category of ‘institutional factors’ draws from the discussion of smart community or smart growth initiatives, not just supportive policies but also the role of government, the relationship between government agencies and non-government parties, and their associated governance (Ibid.). To enable smart city initiatives, it is necessary to establish an ‘administrative environment’ supportive for a smart city, and it should include integrated and transparent governance, strategic and promotional activities, networking, and partnerships (Ibid.). More so than in the other components, smart cities with a governance focus are seen from a user-centred perspective with more emphasis on citizens and other stakeholders (Meijer & Rodríguez Bolívar, 2016).

Smarter government should do more than simply regulate the outputs of economic and societal systems, in a sense where it interconnects with dynamically with citizens, communities and businesses in real time to spark growth, innovation and progress (Nam & Pardo, 2011). Nam & Pardo (2011) continue by stating that smarter government also means collaborating across departments and with communities, to become more transparent and accountable, to manage resources more effectively, and to give citizens access to information that affects their lives. Leading governments are integrating their service delivery, establishing offices that support multiple services and placing the most needed transactions on the web (Ibid.). Smart governance acts as a cornerstone of smart city, by engaging various stakeholders (especially citizens) in decision-making and public/social services (Ibid.). IT-mediated governance or e-governance is key to enabling smart city by bringing citizens to a smart city initiative and keeping the processes of decision-making and implementation transparent (Ibid.). The
consideration of stakeholders is fundamental to the design of smart city, as successful initiatives are
the result of a coalition of business, education, government, and citizens (Ibid.). A successful smart
city can be built from the top down or through bottom up approaches, but active involvement from
every sector of the community is essential as united efforts create synergy which allows individual
projects to build upon each other (Ibid.).

2.3.4 Exploring the three components - Combination

Through their analysis, Meijer & Rodríguez Bolívar (2016) show that there are three ideal-typical
notions (Technology, Human and Institutional) of what constitutes a smart city. Combinations of these
three components have been made plentiful, as can be seen in table 1 as well. One of those examples
is Hollands (2008) in his famous criticism of smart cities and the urban labelling phenomenon, where
he, besides criticizing the ‘urban labelling’ aspect, also delves into the overwhelming focus on
technological determinism, and suggests that there is more to smart cities than technology as he
points towards e-governance and the involvement of various stakeholders. According to Meijer &
Rodríguez Bolívar (2016), a comprehensive definition of a smart city should incorporate all three
components, and they continue by explicitly stating that cities shouldn’t be qualified as either “Smart”
or “Stupid” but should rather be analysed by its structural and cultural characteristics in all three
domains. Ultimately, they present the following definition of a Smart City “The Smartness of a city
refer to its ability to attract human capital and to mobilize this human capital in collaborations
between the various (organized and individual) actors through the use of information and
communication techniques” (Meijer & Rodríguez Bolívar, 2016, p. 398).

2.3.5 Smart Cities – Characteristics

Besides the three components making up a Smart City, there are elements within a Smart City that
define the Smart City, the so-called Smart City Characteristics. The most common usage of these
characteristics stems from Giffinger et al. (2007), who identified six of these characteristics: Smart
Economy; Smart People; Smart Governance; Smart Mobility; Smart Environment and Smart Living.
This framework was developed to capture the key dimensions of European Smart Cities while retaining
simplicity (Manville et al., 2014). A Smart City is, according to Giffinger et al. (2007), “one which is well
performing in these six characteristics, built on the ‘smart’ combination of endowments and activities
of self-decisive, independent and aware citizens” (Giffinger et al., 2007). These six characteristics are
defined as followed:

<table>
<thead>
<tr>
<th>Table 2: Condensed overview of the six Smart City Characteristics</th>
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<tbody>
<tr>
<td><strong>Characteristic</strong></td>
</tr>
<tr>
<td><strong>Smart Governance</strong></td>
</tr>
<tr>
<td><strong>Smart Economy</strong></td>
</tr>
<tr>
<td><strong>Smart Mobility</strong></td>
</tr>
</tbody>
</table>
efficiency, save costs and reduce CO2 emissions, as well as to network transport managers to improve services and provide feedback to citizens. “

**Smart Environment**

“By smart environment we include smart energy including renewables, ICT-enabled energy grids, metering, pollution control and monitoring, renovation of buildings and amenities, green buildings, green urban planning, as well as resource use efficiency, re-use and resource substitution which serves the above goals.”

**Smart People**

“By Smart People we mean e-skills, working in ICT-enabled working [sic], having access to education and training, human resources and capacity management, within an inclusive society that improves creativity and fosters innovation.”

**Smart Living**

“By Smart Living we mean ICT-enabled life styles, behaviour and consumption. Smart Living is also healthy and safe living in a culturally vibrant city with diverse cultural facilities, and incorporates good quality housing and accommodation. Smart Living is also linked to high levels of social cohesion and social capital.”

Source: Manville et al., 2014.

Figure 3 serves as an illustration of the definition of a Smart City by Giffinger et al (2007), in the sense that a smart city is one that is built on initiatives that cover all the characteristics. According to Manville et al. (2014) a successful initiative is one that covers all six characteristics, which is something the author does not agree upon. This could imply that a single successful initiative, covering all six characteristics, could form a successful smart city, as a Smart City is built on initiatives that cover all characteristics. Furthermore, the author believes that initiatives can cover a limited number of characteristics and still be deemed successful, as otherwise, there would be little to no successful initiatives simply because they were not all-encompassing? Manville et al. (2014) add some nuance in the sense that “a Smart City is more than merely the sum of its projects, but rather it needs a fertile environment guided by a clear vision, the participation of relevant actors (people) and the efficient and effective organization of its processes” (Manville et al., 2014).
2.3.6 Smart Cities – The relationship between characteristics and components

The characteristics used to classify Smart Cities include the areas addressed by Smart City initiatives and, as such, are the ends to which stakeholders participate in an initiative (Manville et al., 2014). Manville et al. (2014) continue by stating that these characteristics can be seen as the means by which those ends are the achieved components. The components cover a wide range of activities, resources, and methods, and can be conceptualized as the building blocks of Smart City initiatives (Ibid.). These components can perform as a key driver for specific characteristics but can also cover several characteristics at the same time (Ibid.). Figure 3 shows the relation between components and characteristics and can be viewed as an addition to the model of Nam & Pardo (2011) shown in Figure 2.
In some cases, the characteristic fully describes the initiative by displaying what the initiative is about and the priorities of this initiative, and whom or what will be the beneficiaries (Manville et al., 2014). However, sometimes, the characteristics function as a vehicle for the components, and the initiative is mostly a way to bring people together, i.e. to create new ways of collaborating (Ibid.). In some cases, the linkage from objectives to characteristics to components is direct, as an objective is carried out by a specific initiative with an associated characteristic that justifies the use of a component (Ibid.). The linkage can of course also be indirect.

Components have two roles in this conception: 1) the availability of existing components can make it easier to mobilize and complete Smart City initiatives and; 2) They can be regarded as desired by-products of these very initiatives, to the extent that they are developed or improved during the time an initiative runs (Manville et al., 2014).

2.4 Smart Cities – From an abstract concept to a real-life application

Bar a few exceptions (such as Lindskog (2004)) many of the articles discussed in this paper have talked about smart cities as an ideal-type concept, and not so much what is happening in “real” smart cities, this section aims to highlight some case studies that have been carried out, in order to link the abstract concept of smart cities to those that have emerged.

Townsend (2013) and Fernandez-Anez et al. (Forthcoming) portrayed this “generalness” of the smart city concept and suggested that this may be a logical consequence of the way this concept is used. Meanwhile, there appears to be a growing need in the urban communities for both greater understanding of and the degree of embedding required by the various ICT solutions together with how they will impact urban development (Coccossis et al., 2017). These ICT solutions (and connected policies) have been tried in various spatial settings and through the adoption of different practices, and in many cases have been embraced and/or marginalised due to the social, political, economic and cultural environment in which they were incorporated (Ibid.). This means that technology-oriented policies in practice are context and disciplinary-dependant and as such may face losing their outlook.
when confronted with different urban realities (ibid.). Capdevilla & Zarlenqa (2015) showed how this, when the policy priorities shift towards technical solutions only, may effectively detach the impact of these solutions from the real problems and needs a city is facing.

For smart city projects to be effective in addressing the real needs of local communities, these local communities need to be involved to a bigger extent. (Coccossis et al., 2017). Coccossis et al. (2017) suggest that the need for local community involvement can be achieved through the idea of co-production. Co-production, in this sense, is defined by Coccossis et al. (2017) as “the voluntary or involuntary involvement of public service users in any of the design, management, delivery and/or evaluation of public services”. Even though it is still unknown what the real additional value of co-production is, it is argued often that by advancing citizens’ participation in both the planning and production of smart services, the “smartization” process earns the highest possible legitimization while the smart vision is embraced by the whole community, thus contributing to the sustainability of this smart city concept (Coccossis et al., 2017).

In figure 5 the conceptual model of co-smartization by Coccossis et al. (2017) is presented. The process is merging the strategization with the notion of co-production and involves two time-distinct phases: co-planning and co-production, while the third phase co-evaluation happens at every stage of the projects (Coccossis et al., 2017). In order for the co-planning phase to be successfully realised, an advanced participation of local stakeholders is vital, since this phase consists of the creation of the smart vision and the development of a strategic plan and the local community’s representation is crucial to encompass the real needs and targets within the smart project (Ibid.).

The co-production phase consists of three processes: the development of an operational plan; the implementation of the projects entailed in this plan and finally the provision of smart services and this phase as a whole is at the center of the co-smartization process as the assets of the city should be utilized in the most efficient way (Coccossis et al., 2017).

Figure 5: Strategization and co-production in a co-smartization process

Coccossis et al. (2017) then applied their concept of co-production in a co-smartization process on two case studies in Greece. As in many other cases, the utilization of the smart city concept is an imported
notion constructed from international experiences and reflecting a (relative) compliance of both local and regional institutions to EU policy. For this reason, some local authorities have adopted the concept of smart cities and implemented it from a top-down perspective. This is important as it seems that most of these initiatives in Greece have surpassed the national state and are the result primarily of a direct relationship with EU policy and partially with the private sector. (Coccossis et al., 2017).

The analysis of Coccossis et al. (2017) shows that most – if not all - of the Greek cities that adopted a form of the smart city concept have done so in an unbalanced and discontinuous way, meaning that they mostly focussed on specific policy goals rather than a coherent smart city. Coccossis et al. (2017) focus on two Greek cities (Trikala and Heraklion), for these are the most advanced smart city cases in the country.

The medium-sized city of Trikala has successfully adopted a smart city rationale, with emphasis being given to smart government, smart economy, smart mobility and smart living, but it lies far from constituting a co-smartization process, as neither the level of stakeholders’ representation nor the current structure of e-service provision inhibits a co-smartization rationale. (Coccossis et al., 2017). Interestingly though, Coccossis et al. (2017) regard Trikala as a “bottom-up” smart city in the sense that it was an initiative driven mostly by local agents, which seems rather contradicting to what they concluded before.

The making of the smart city policy in Heraklion is rather different from the path followed in Trikala. Initially the smart city in Heraklion embarked on fostering ‘smart’ initiatives triggered by the municipality and the university, which were already existing before the city adopted its strategic smart city plan in 2016, as the region embodies a large pool of technological and academic actors. This strategic plan followed by Heraklion is merely indicative and portrays the prevalence of a technologically driven attitude, offering opportunities to use technology to fill in selective aspects and policy issues that are not part of the main urban strategy, and as such operates in a socio-economic vacuum, lacking a co-production dimension. (Coccossis et al., 2017).

While these specific case studies may not be as interesting or important to this research project, the resulting findings and challenges highlighted by Coccossis et al. (2017) may turn out to be relevant. Coccossis et al. (2017) identify two main challenges for cities incorporating smart city activities. The first concerns the institutional context of governance in a place, which is the framework within the government and stakeholders work, as a background for building up new activities. An integration of top-down and bottom-up initiatives may be essential for service co-production and innovation, Coccossis et al. (2017) state. Furthermore, there is a need for effective and efficient implementation, which requires monitoring and evaluation as well as commitment and involvement of stakeholders and the public (Coccossis et al., 2017).

2.5 Criticizing the Smart City – Popularity contest or a legit strategy?

The discourse on the smart city promises an era of innovative urban planning, driven by urban technologies that will make cities cleaner, prettier, safer and more efficient, all through the application of ICT (Hajer & Dassen, 2014). As a result, planning will become a continuous experiment, and cities will serve as living labs (Ibid.). As addressed before however, the smart city concept does not only warrant praise. Hollands (2008) is perhaps the most famous proponent of this criticism on the label “smart city” and how these labels are used, as the problem with this urban labelling according to him is that it becomes problematic to separate the hype and the “marketing use” of such terms such as smart city as opposed to referring to actual infrastructural change or evidence of effective IT policies. Finally, Hollands (2008) argues that these terms are by nature often very positive and uncritical towards urban development, for which city does not want to be smart, creative, and/or cultural?
According to several criticasters, the idea of a smart city reinforces the idea of urban spaces from a neo-liberal perspective, having an emphasis on business-led development (Capdevila & Zarleng, 2015). While policy makers have used the concept to try to provide more efficient and innovative services to citizens, businesses have seen a huge opportunity in developing infrastructure and technology for those cities that embrace the smart city approach (Ibid.). Consequently, firms are dedicating vast resources to strengthen their relationships with urban decision makers, and as a result, smart city policies may not only provide solutions to urban problems, but also risk being responding to commercial pressure from the private sector (Ibid.). The utility of a smart city as such has morphed from being an assumed public benefit to exploiting recognition as a desired market for producers with new concepts and technologies (Glasmeier & Nebiolo, 2016).

A potential risk at hand originating from smart city policies is then that these policies stem from a technology-push rather than a demand-pull (Capdevila & Zarleng, 2015). There is a lot of excitement about new possibilities that can be deemed as ‘nice to have’, whereas the there is a group of ‘need to have’ possibilities that could do with some smart support (Hajer & Dassen, 2014). Now, technology and planning are mostly funding projects that address isolated, one-off problems (Glasmeier & Nebiolo, 2016). Furthermore, governments are under great pressure to adapt the smart city approach, to strengthen the image of their city, and to improve their city branding and visibility, as city rankings have become double-edged swords which expose cities to global competition and risk to introduce measures that impact their “ranking”, but not so much the lives of their citizens, as Hollands (2008) proclaimed (Capdevila & Zarleng, 2015). Consultancy reports designate winners and losers, and picking winners is quickly becoming the specification system identifying the conditions to regarded as a smart city (Glasmeier & Nebiolo, 2016). In this situation, what “is” a smart city is defining what a smart city should “be”, regardless whether there is valid evidence to support that picture (Ibid). As Townsend (2013) puts it more dramatically: “the attempt at engineering seamlessness acquires a new and pernicious valence. A remarkably passive notion of urban subjectivity and even citizenship is inscribed in the visions of the smart city we’ve been offered, one that asks of our lives only that they be convenient and of us only that we acquiesce to the creeping privatization of municipal services.” (Townsend, 2013, chapter 7, paragraph 8).

The pressure of becoming (or wanting to become) a smart city leads places to adding their embellishments to the definition of smart to embody more encompassing qualities, no matter how ill-defined and application-specific those qualities are (Glasmeier & Nebiolo, 2016). The more amalgamated the definitions become, the more they remain void of actual content and the further they stray away from explicit goals and objectives of modern cities (Ibid.). Then there is the notion that generic concepts of smart cities imposed on cities will not work, as can be seen from the examples of experimental green cities such as Songdo or Masdar, which are the result of sustainability incorporated in the planning concepts of the 20th century and, even though they have been created on “an empty sheet”, they have not lived up to their promises (Townsend, 2013; Hajer & Dassen, 2014; Glasmeier & Nebiolo, 2016).

Townsend (2013) criticizes the “generalness” of these canonical smart cities. These are all built on greenfield sites, with as little hinder occurring from existing structures as they’re building on a blank slate (Townsend, 2013). Furthermore, the smart city unfolds in generic time, as many (proposed) solutions “can” or “will” impact the future, making these places a form of “proximate future”: we’re almost there, but never quite there yet (Ibid.). The same goes for unspecified technology, where many factors other than just the technology itself may impact the success of an invention, but these are hardly ever reflected on (Ibid.). According to Townsend (2013), this is a logical consequence of the very concept of smart cities: only by proposing to install generic technology in a generic future can proponents of the smart city avoid the complexity that emerge any time actual technologies are deployed in existing places.
Angelidou (2017) states that, from the analysis of 15 Smart City Strategies, while it can be observed that enhancing civic innovation and citizen participation is a primary objective for many smart city strategies, the process of empowering citizens is not an easy one and for the time being it seems that the social aspects and welfare of people and communities have a secondary role in smart city strategies. Many smart city strategies are disconnected from their surroundings and most only address privacy and security vaguely (Ibid.).

In addition, smart cities may only provide a useful solution for a handful of cities, as the clear majority of the world’s urban centre will remain as spectators while (predominantly European and American) cities “re-invent” the urban model and continue to tinker with the elements of the smart city recipe that emphasizes technology and ICT (Glasmeier & Nebiolo, 2016).

A final point of attention for all smart city project should be the digital divide. As digital services are becoming consolidated in our daily lives more and more, we need to be aware of people that are excluded from these services, or do not have the skills or access to use them in a proper way, and they should be provided with an alternative way to get access to public service (Breuer et al., 2014).

Looking at the discourse on Smart Cities Hajer & Dassen (2014) identify five main components. First, the debate on smart cities is heavily dominated by concepts such as big data, smart grids, efficiency, monitoring and information, implying a highly managerial take on cities with new possibilities and opportunities stemming from technology first and foremost, which are then applied to urban problems. Second, smart cities are often discussed in new cross-over situations in which businesses, knowledge institutions and governments find each other. Third, smart cities are oriented to an organisational idea, as new opportunities are linked to public-private partnerships. This shift from public infrastructure to public-private partnerships, which has been questioned by Capdevilla & Zarlenga (2015) inter alia may result in a societal change as the way in which consumers pay for their urban services is likely to change. Fourth, the smart city approach sees innovation primarily as a technological matter, in which the conditions under which a liveable, futureproof city must be achieved are rarely discussed. Given the difficulty of transplantation of solutions, it seems important to pay more attention to the conditionalities of successful applications. Fifth, smart city discourse tends to be very weak in terms of historical awareness. Whereas Hajer & Dassen (2014) emphasize the importance of history, the smart city discourse often addresses “inefficiencies” which may very well be the result of historical political choices. (Hajer & Dassen, 2014).

Many of the critical notions on smart city concepts are typical examples of the bottom-up perspective criticizing the top-down smart city model, which may often lead to value preferences predict contributions and responses of proponents of both (Hajer & Dassen, 2014). An urban transition, according to Hajer & Dassen (2014), is not consisting of simply fitting solutions to various problems, but rather should be perceived as a complex and multi-faceted endeavour. Reflecting on the past may show what it takes to get moving and what may be encountered on the way, as people will push back, and vested interests will resist, resulting in smart solutions that will not work (Hajer & Dassen, 2014). The smart city concept claims “perfect knowledge”, which appears to be incompatible with the messy reality of all known information-processing systems, the human individuals and their secrets (Townsend, 2013). What Hajer & Dassen (2014) try to convey is that urbanisation is the outcome of a process of ‘discourse formation’ in which coalitions are shaped that will ultimately push a certain agenda. The actors in this coalition do not necessarily have to agree on all the details, but they agree on a specific strategic direction (Ibid.).
2.6 A case for bottom-up smart cities?
The bottom-up understanding of what a smart city is derived from the people using the city, who are in turn those that change and improve the city (Walravens, 2016). One of the main strengths of the bottom-up approach is that these approaches often have a sharp image of the reality in which interventions should be done, and there often is broad local support for these initiatives and their goals (Oostra, 2013).

The smart city is, because of this, about the smart citizen; those who live, work and engage in all kinds of activities in the city (Ibid.). A participatory approach through the engagement of stakeholders in a bottom-up way in planning and public policymaking is hardly a new concept (Angelidou, 2017). In a Smart City however, the city’s users, whether they are entrepreneurs, citizens or communities, can be engaged on a large-scale and in real-time using various opportunities such as Web 2.0, smart devices etc. (Ibid.). This aspect of smart cities has often been cited as basic ingredient for successful smart city strategies, and one which may allow for the overcoming of some of the criticisms mentioned in the previous section.

While bottom-up initiatives are thus often put on a pedestal in literature on Smart Cities, these can be criticized too. A lack of coordination between initiatives can lead to suboptimal results, and many initiatives find themselves re-inventing the wheel due to a lack of communication and coordination (Oostra, 2013). Furthermore, although these characteristics have a positive impact on the local scale, they often do not overlap with objectives of policy makers and therefor result in conflict as these “chaotic” bottom-up processes oppose the idea of a master plan (Walravens, 2016.). The small-scale interventions are often short-term, cheap and aimed at increasing the quality of life in a certain way, or addressing a specific local concern, and in such a way, the smart city is not defined by the infrastructures or architecture it offers, but the ways in which its citizens interact with these systems as well as each other (Ibid.).

While master plans, or ideal and controllable states often do not deliver what they promised, it seems unfeasible to rely solely on bottom-up processes (Walravens, 2016). While these bottom-up processes can have desirable impacts, they often lack a vision, are (very) short term and can conflict with some of the long-term goals set out by local policy and may not even be legal (Ibid.). Walravens (2016, p. 131) therefore argues for a “smart citizen” that “uses a variety of tools to interact and move around the city, and for whom the emphasis lies on his/her citizenship, rather than technology as a primary factor”. However, relying on bottom-up initiatives solely remains problematic, and thinking about the city for the future cannot place all responsibility with its citizens and entrepreneurs (Ibid.).

2.6.1 Above and beyond merely top-down or bottom-up?
While both the top-down as well as the bottom-up approaches to the smart city have their merits, both exhibit their own substantial problems, and change seldom stems from purely top-down nor bottom-up (Walravens, 2016).

Walravens (2016) therefor proposes a combination of top-down and bottom-up approaches and establishes the smart city as a platform that fosters collective intelligence of all affected stakeholders. The smart city then becomes a meeting place for the public sector, private interest and citizens, where they can come together to generate new value, collaborate and innovate (Ibid.). Such a local innovation platform is not without problems either, as organizing such an intense collaboration is not an easy endeavour and valorisation may be an issue as well (Ibid.). It often proves difficult to transcend the concept or idea phase and to develop this into a real application or service that adds value to citizens (Ibid.).
Walravens (2016) thus proposes that a smart city should capture creative and collaborative innovation through interactions between public bodies, businesses and citizens in: dealing with the data flood, digital footprint and data trails; identifying and tracking new relational components between actors; facing grand societal challenges in a local context and finally offering new and engaging experiences to citizens. At the core of a smart city, Walravens (2016) sees three constituting characteristics of a truly innovative smart city: being collaborative, collective and contextual (See also figure 6).

Figure 6: Characteristics of the smart city

| Collaborative: Working with all stakeholders, including citizens, using open innovation methods |
| Contextual: Making sense out of the data flood |
| Collective: Aiming to tackle grand societal challenges |


In his view, a purely top-down view on the smart city carries the danger of authoritarianism, whereas an approach solely formed around the bottom-up leans towards chaos, and rather than trying to find the “perfect definition” of a smart city, approaching the concept using the three components mentioned in figure 2.

Hajer & Dassen (2014) suggest that it may be best to avoid the dichotomy between top-down and bottom-up approaches in smart cities. The way we are building cities right now is unsustainable and creating costly, unattractive, unhealthy cities laid out in patterns of urban sprawl, and combined with an increasingly vulnerable government, and therefor Hajer & Dassen (2014) argue we need to align the agents of change to make liveable cities become reality through, what they call “smart urbanism”. This so-called smart urbanism is described as “a powerful integrative and action-oriented body of thought on cities that emphasises their particular histories, the social composition of cities, analyses the resource it takes to ‘run’ a city, provides insight into the intricate ways in which design, politics, and business interrelate, and helps to think of the institutional formats that can help deliver on the transition needed” (Hajer & Dassen, 2014, p. 13).

Around this notion of smart city, the future of planning and design is being discussed, and it should be stressed that this reordering is fuelled by the challenges that cities face (Ibid.). What we are seeing in this time of smart cities is the old institutionalised power offering a chance for debate, allowing new actors to join the table and discuss new issues in the established fora (Hajer & Dassen, 2014). As the balance between government, market and citizens is changing, the government slowly leaves more room for citizens and their bottom-up initiatives (Bureau Nationale ombudsman, 2018).

2.7 Conceptual Models of the “Real Smart City”

Fernandez-Anez et al. (forthcoming) studied the use of conceptual models in the literature on smart cities and propose their own integrated model that links the three main issues they identified in the literature: (1) the key role of governance and stakeholders’ involvement; (2) the importance of displaying a comprehensive vision of Smart City projects and dimensions; and (3) the understanding of the smart city as a tool to tackle urban challenges. Because governance structures are considered the core of the smart city, stakeholders are placed at the centre of their model, see figure 7.
The stakeholders are made up of the university-industry-government triple helix model with civil society being included to form four stakeholder groups at the centre of the model: Political, social, economic and knowledge stakeholders. In their model, political stakeholders include government institutions and political parties; social stakeholders are civil society experts and institutions; economic stakeholders make up a wide range of public and private companies; and knowledge stakeholders comprise of universities and research centres. (Fernandez-Anez et al., forthcoming).

Smart city initiatives are organised around stakeholder groups and various urban challenges, and can affect more than one stakeholder groups, which is mandatory should they aim to be integrative. Because smart city governance initiatives often lead to the development of other smart city dimensions, Fernandez-Anez et al. (forthcoming) place these governance initiatives at the centre of the conceptual model. The stakeholders are at the core of the city system and are supported by two urban functional subsystems: (1) **Spatial**: the elements in the human-built environment such as urban infrastructures, housing, open spaces etc.; (2) **Technological**: The various technological tools developed in the city, mainly based on IT and information transfer. (Fernandez-Anez et al., forthcoming).

The model by Fernandez-Anez et al. (forthcoming) is heavily inspired by Giffinger et al. (2007) and can be viewed as an evolution of the models used by Nam & Pardo (2011) and Manville et al. (2014) which can be seen in **Error! Reference source not found.** figure 2 and figure respectively. Fernandez-Anez et al. (forthcoming) add both the stakeholders and citizens in the middle, as well as global trends and challenges. As argued before, smart cities are implemented to respond to a variety of urban challenges. These are the result of global trends, which have been identified by Fernandez-Anez et al.
(forthcoming) and help defining the conceptual model of a smart city by showing to which trends and challenges these smart city initiatives are responding (Fernandez-Anez et al., forthcoming).

While testing their model on the city of Vienna, Fernandez-Anez et al. (forthcoming) proved that the model can be useful for showing the current state of implementation and stakeholders’ opinions/perceptions/assessments of the smart city strategy to compare the implementation and discourses and identify the common points and differences between them. Furthermore, it demonstrated that the conceptual model can be used to narrow the gap between the discourse and implementation. This may prove useful for the future development of a smart city strategy, as Manville et al. (2014) recommend that the design of Smart City initiatives and strategies should begin with an assessment of the city’s performance and needs. However, coming back to the model used here, Fernandez-anez et al. (forthcoming) state it requires simplification for easy communication with civil society groups.

Monzon (2015) provides a more simplified overview of challenges for European cities (see figure 8) which is inspired by the six domains of Giffinger et al. (2007) and can thus seemingly be integrated with the conceptual framework of Fernandez-Anez et al. (forthcoming) to provide a more simplified model.

*Figure 8: Challenges for European Cities*

<table>
<thead>
<tr>
<th>Governance</th>
<th>Economy</th>
<th>Mobility</th>
<th>Environment</th>
<th>People</th>
<th>Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flexible governance</td>
<td>Unemployment</td>
<td>Sustainable mobility</td>
<td>Energy saving</td>
<td>Unemployment</td>
<td>Affordable housing</td>
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<tr>
<td>Shrinking cities</td>
<td>Shrinking cities</td>
<td>Inclusive mobility</td>
<td>Shrinking cities</td>
<td>Social cohesion</td>
<td>Social cohesion</td>
</tr>
<tr>
<td>Territorial cohesion</td>
<td>Economic decline</td>
<td>Multimodal transport system</td>
<td>Holistic approach to environmental and energy issues</td>
<td>Poverty</td>
<td>Health problems</td>
</tr>
<tr>
<td>Combination of formal and informal government</td>
<td>Territorial cohesion</td>
<td>Urban ecosystems under pressure</td>
<td>Urban ecosystems under pressure</td>
<td>Ageing population</td>
<td>Emergency management</td>
</tr>
<tr>
<td>Mono-sectoral economy</td>
<td>Traffic congestion</td>
<td>Climate change effects</td>
<td>S.diversity as source of innovation</td>
<td>Urban sprawl</td>
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</tr>
<tr>
<td>Sust. local economies</td>
<td>Non-car mobility</td>
<td>Urban sprawl</td>
<td>Cyber Security</td>
<td>Safety and Security</td>
<td></td>
</tr>
<tr>
<td>Social diversity as source of innovation</td>
<td>ICT infrastructure deficit</td>
<td>Urban sprawl</td>
<td>Cyber Security</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICT infrastr. deficit</td>
<td></td>
<td></td>
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</tbody>
</table>


The main challenges that cities face in the Smart Governance field are related to the need for a change of government model, with governance models facing the challenge of making themselves more flexible to combine top-down policies with bottom-up initiatives, alongside demographic changes and territorial cohesion as the three main challenges (Monzon, 2015).
The Smart Economy action field challenges are related to the productive structure of the city, primarily the creation of a multi-sectoral economy which would make the city more resilient to economic downturns, while exploiting the unique characteristics of the urban agglomeration (Monzon, 2015).

The overall challenge in the Smart Mobility action field is to achieve a sustainable, inclusive and efficient mobility system for both goods and people, through the implementation of a multimodal public transport system, fostering alternatives for car-based mobility and making public transportation reachable and available to all citizens, thereby reducing congestion and pollution in the city while reducing pollution (Monzon, 2015).

Challenges related with the built and natural environment can be found in the Smart Environment field. On the one hand, there is a need for the reducing of land consumption for the extension of cities, avoiding urban sprawl and looking for denser and liveable cities through a mix of uses and concentration of population. On the other hand, reducing the energy consumption, pollution and CO₂ emissions is a growing ecological demand for achieving sustainable development. (Monzon, 2015).

Improving social cohesion and the quality of life are the main challenges in the Smart People field. An enriching community life is the final goal, and to do so it is necessary to take initiatives using the demographic movements and mix of population as an opportunity for innovation, taking into consideration all citizens independently of their age, gender, culture or social condition. The main challenges in this field are related to the supply of housing, health conditions, and crime rate. These three aspects, together with the social cohesion of the population, are the main issues that set difference for a city to be able to talk about quality of life. (Monzon, 2015). Figure 9 shows the relation between these Smart City Dimensions and challenges that cities may face.
In smart city literature, governance is often seen as referring to citizen participation and to collaboration between stakeholders, which could point to the need for a transformation of government structures to create a smart city, as indicated before by i.e. Meijer & Rodríguez Bolívar (2013) (Castelnovo et al., 2016).

2.8 Conclusion
With this, chapter two comes to an end. The chapter started with an introduction to the vague concept of smart cities, which is commonly discussed, but often under a different premise. Smart Cities can define themselves, and what they deem worthy to be called “smart”. Starting from the literature however, some common components and characteristics of Smart Cities can be identified. A beginning towards a uniform outlook on Smart Cities and what is Smart and what isn’t has been made. However, while this body of research was inspired by the vagueness of the concept, another issue has come to mind. While Smart Cities are sometimes put on a pedestal, others grew very wary of the concept. A large amount of the criticism can be traced back to the top-down nature of Smart Cities. Many authors thus believe that there is a specific role for a bottom-up component in Smart Cities, and some have even tried to evaluate Smart Cities through this very bottom-up component. This piece of research continues where these authors left off and will continue by investigating the (as they call it themselves) “most bottom-up Smart City in the World”, Amsterdam.
3. Research design and Methodology

3.1 Introduction
In this chapter, the research strategy, design and approach which are necessary to investigate the previously defined research question will be displayed.

3.2 Research Design
The intent of this research is to develop a better understanding of a possible bottom-up component in Amsterdam Smart City, and to which extent this bottom-up component, which is rumoured to exist, exerts an influence on the ASC concept. While the existence of a bottom-up component in Smart Cities has been claimed by various authors, very little evidence has been provided on the exact composition of this component and what it contributes to the smart city concept. This has thus yet to be investigated by scholars. As a result, it was decided to focus on exploring the bottom-up component in one of the Smart Cities in which it is rumoured to exist, Amsterdam. Multiple reasons can back up this decision. First, the assumption has been made that Amsterdam, regarded as one of the top bottom-up Smart Cities in the world, would provide an excellent environment that will provide new insights in the bottom-up initiatives that may affect a Smart City. Moreover, this provides an opportunity to evaluate both the Smart City concept and the state of Amsterdam Smart city. Second, the context of Amsterdam and the local language are known to the author which will provide a better understanding of the case and its environment. Due to the lack of prior research it was decided to investigate the theoretical concept of a bottom-up smart city in the real world of Amsterdam Smart City.

A Qualitative research approach has been chosen, since it best suits the purpose of this research in establishing an all-encompassing mapping of the bottom-up component of Smart Cities. Although qualitative research is often criticized for concerns of decreased external validity, a conscious decision has been made for these methods for the following reasons. First, this research aims at discovering the impact which the bottom-up component of Smart Cities may have on the Smart City concept, which is rather difficult to apprehend from a quantitative perspective. More-so, a qualitative approach allows for the development of concepts and theories following the initial analysis. Second, as this thesis aims to develop understandings in a new research setting, a qualitative approach is more appropriate than a quantitative model. Third, qualitative research methods are more suitable when studies have an exploratory nature, as this paper intends.

3.3 Research Design
In this part of the methodology chapter, the design of the research will be explained, with an explanation why a case study research design was chosen, alongside a justification of the research sample.

3.3.1 Case study design
Gerring (2007) provides various arguments for the use of a case study over cross-case analysis, as the latter is met with an increasing amount of scepticism over recent years. For example, the case study provides a more varied set of tools to capture the complexity of social behaviour, which aim to preserve texture and detail of individual cases, which is often lost in large-N cross-case analyses (Ibid.). While stating so, the methodological status of case studies is still suspicious, as confusion arises over the virtues and vices of this type of research design (Ibid.). Practitioners fail to articulate what it is they are doing methodologically speaking. Furthermore, the case study has been faulted for its lack of representativeness, and its lack of rigor in the collection, construction and analysis of empirical materials in a study (Hamel et al., 1993). The case study is a research strategy which focuses on understanding the dynamics present within a single setting (Eisenhardt, 1989). While case studies
have often been used in empirical research, it is often held to a low regard, or ignored within the academic world (Flyvbjerg, 2011). Case studies, as Flyvbjerg (2011) states, can produce context-dependant knowledge depending. Since social science has not been able to produce general, context-independent knowledge, it requires a method which is able to grasp this very context-dependant knowledge (Ibid.). While many state it is impossible to generalize from a case study, Flyvbjerg (2011) begs to differ, as case studies are ideal for falsification, and as such, the case study may very well be central to scientific development through generalization. The value of a case study will then depend on the validity claims that researchers can place on their study (Ibid.). This section aims to clarify why the choice of a case study method is justifiable in this research.

According to Gerring (2007) a case study can be understood as “The intensive study of a single case where the purpose of that study is – at least in part – to shed light on a larger class of cases (a population)”. The use of a case study is most suitable for researching phenomena that are context-dependant (Swanborn, 2010). The use of a broad research question, which leads to more specific, precise questions during the process of research often leads to a case-study strategy, as the rather simple causal model at the beginning of the process has evolved to a search for intervening variables in a causal chain (Ibid.). Besides, case studies are the main research strategy in cases of rare phenomenons, such as the very concept of a Smart City being one which can’t be replicated in a laboratory setting, which requires it to be studied in a setting that is existing (Swanborn, 2010).

The intention of this research is to develop an understanding of the functioning of the bottom-up component of Amsterdam Smart City, and how this bottom-up component exerts influence on the Smart City debate. While Fernandez-Anez et al. (forthcoming) have performed a similar study in Vienna, the bottom-up component in Amsterdam has not been studied to this extent. This is especially interesting since Amsterdam claims to be the world’s first “bottom-up Smart City” and is seen as the “leader of the pack” among cities attempting a bottom-up approach to smart cities (Amsterdam Smart City, 2016). Amsterdam is widely seen as one of the top 5 Smart Cities in the world, and Europe’s #2 smart city in recent years, with a lot of attention for its residents (Amsterdam Smart City, 2016). The rarity of bottom-up smart cities furthermore contributes to the selection of Amsterdam as a case study subject.

3.3.2 Document Analysis and Data Collection

Document analysis is a procedure for evaluating or reviewing documents, which intends to gain understanding and develop empirical knowledge through data examination and interpretation (Bowen, 2009). It is particularly applicable to qualitative case studies, with non-technical literature being a potential source for empirical data (Ibid.). In studies designed with an interpretative paradigm, documents can be used as the only necessary data source (Ibid.).

Documentary material can provide supplementary research data, and the insights and information derived from documents can be valuable additions to a knowledge base (Bowen, 2009). Furthermore, documents can be analysed to verified or corroborate evidence from other sources, where contradictory evidence can be a probe to investigate further (Ibid.).

The advantage of document analysis is that it has a lack of obtrusiveness and reactivity, which implies that the information gained is unaffected by the research process, and counters concerns related to reflexivity inherent in other qualitative research methods (Bowen, 2009). Reflexivity is often not an issue in using documents for research purposes, and the investigator’s presence does not alter what is being studied (Ibid.). The potential flaws of document analysis include a biased selectivity, where the only available documents are likely to be aligned with the preferred outcome as well as insufficient detail or access to documents being deliberately blocked (Bowen, 2009).
The use of a document analysis is particularly useful in this research, as much of the required information is readily available in various sources surrounding Amsterdam Smart City and the variety of initiatives.

To research the bottom-up component of Amsterdam Smart City concept, a selection of initiatives had to be made. All 254 projects mentioned on the official website of ASC were included. Furthermore, a selection of supposed bottom-up initiatives that were not affiliated with ASC was made. This sample has been based on two sources that contained an enumeration of supposed bottom-up initiatives in Amsterdam. The complete overview of these initiatives can be found in Annexes A, B, G and H. Each initiative was analysed in isolation following a strict procedure.

Document analysis involves skimming through documents, reading them and interpreting these documents (Bowen, 2009). For each initiative in isolation, these steps were performed. For each of the 254 initiatives, a versatile collection of sources was consulted. Second, these documents were skimmed through and deemed useful or not, which led to the dismissal or continuation to the next step, which involved reading these documents more thoroughly. Through triangulation of the various sources, the questions regarding each initiative could be answered. Triangulation of the sources prevents the use of solely one data source which may not necessarily be precise, accurate or complete (Bowen, 2009). The quality of data and the amount of information necessary for the analyses of each initiative differed case-by-case.

3.4 Study objects
This section will clarify which definitions have been used for the various parameters in this analysis, which have been used to identify whether initiatives are smart, and whether they are bottom-up or not.

3.4.1 “Smart City”
While this research originated from the confusion surrounding the concept of Smart Cities, it is critical to set a definition that will be used to determine whether projects fit the narrative of being “smart” or not.

The city of Amsterdam has built its Smart City concept along the lines that Giffinger et al. (2007) propagated, which has resulted in a Smart City revolving around six themes that are remarkably close to the six smart characteristics that Giffinger et al. (2007) proposed. One way to assess the projects within Amsterdam Smart City, and their “smartness” would thus be to check to what extent they are in line with the six smart characteristics. However, as the author noted before, initiatives can be successful while focusing on a select few of these characteristics and while the Smart City needs to perform well in all to be successful, this does not necessarily have to be the case for an initiative. Furthermore, these characteristics seem too general to be applicable to initiatives, which are more grounded in their environment and location, and as a result not necessarily focusing on all which is carried by the umbrella-term of a smart characteristic.

Vanolo (2013) criticized the smart city concept fiercely and stated that a Smart City is not much more than a slogan, lacking actual content, whose proponents can use the term in whatever ways suits them best. What Vanolo (2013) and others are saying is the concept of a Smart City lacks body, structure and validity throughout the concept. While this is harsh, this opens a way to assess the initiatives in a Smart City, through the evaluation of the internal coherence. Without having a formal definition or definitive way to evaluate smart cities from the outside, the most critical perspective is to look at Smart Cities from the inside, and to see whether they stick to the very goals they set out themselves. Amsterdam Smart City uses, like many, their own definition, and see it as: “A smart city is a city in
which social and technological infrastructures and solutions facilitate and accelerate sustainable growth, ultimately aiming to become a futureproof and liveable city” (Amsterdam Smart City [ASC], 2018-A). Initiatives part of the Smart City should thus be expected to contribute to creating and accelerating sustainable growth to create a liveable city, through social and technological solutions. As it stands, initiatives that fail to do so, or focus on other goals, do not contribute to the creation of a Smart City, and can thus, in the case of Amsterdam, be regarded as initiatives that are not smart.

3.4.2. Bottom-up

While there is no universally accepted definition for “bottom-up initiatives”, Miazzo & Minkjan (2014) provide a point of departure in the book “We Own the City”, where they state that bottom-up initiatives are “urban development projects including end users not only as consumers but also as co-decision makers, co-creators and/or co-managers before, during and/or after the construction/renovation phase” (Miazzo & Minkjan, 2014). While this is a helpful notion, the author believes this definition is too broad, and leaves room for projects that are initiated top-down for example, but involve end users, which is not what the author considers to be a bottom-up initiative. Furthermore, the usage of “urban development projects” seems to exclude initiatives that do not necessarily directly impact urban development but could still be considered “smart” or impact the smart city, for example a bottom-up vehicle sharing system.

While not exactly tailored to bottom-up initiatives per sè, de Nationale ombudsman (2018) with provide an interesting definition of a citizens’ initiative: “By citizens’ initiatives we mean initiatives by individual citizens or groups of citizens who committed to contribute to (local) society (...). The initiative can relate to others but also to the initiators themselves. The characteristic of a citizens’ initiative is that there is no established organization behind it. It is about the own ideas and commitment of citizens”.

Obviously, this definition cannot be directly applied to bottom-up initiatives as it leaves out room for entrepreneurs and/or NGOs, but it provides an interesting point of discussion and may help demarcate what bottom-up initiatives are by adding to the definition of Miazzo & Minkjan (2014). Walravens (2016) explicitly states that bottom-up initiatives can also come from small or medium businesses, or start-ups that aim innovative in a certain urban sector and provides Uber as an example.

For this research, the following definition of “bottom-up initiatives” is used “Bottom-up initiatives are projects revolving around the own ideas and commitments of citizens, entrepreneurs and civil organizations, which include end users not only as consumers but also as co-decision makers, co-creators and/or co-manager, and in which entrepreneurs, citizens or groups of citizens contribute to (local) society without there being an explicit established organization pushing its ideas.”

3.4.3 Urban Challenges

As cities continue to grow, their challenges need to be carefully thought out so that population growth, economic development and social progress can advance without negative externalities (Monzon, 2015). Both Fernandez-Anez et al (forthcoming) and Monzon (2015) provided an overview of Urban Challenges which cities faced or may face in the future. Using the identified Smart City Dimensions by Giffinger et al. (2007), challenges have been identified in these different dimensions by Monzon (2015). This list of challenges created by Monzon (2015), as well as those implied by Fernandez-Anez et al. (forthcoming) have been used in conjunction with the challenges identified through a review of Amsterdam and its Challenges, to create an overview of the expected challenges for Amsterdam. The result of which can be seen in Table 3.
Table 3: Smart dimensions and their respective urban challenges identified in the literature review (Amsterdam Economic Board, 2018; Amsterdam Smart City, 2018-B; Fernandez-Anez et al., forthcoming and Monzon, 2015).

<table>
<thead>
<tr>
<th>Smart Dimension</th>
<th>Urban Challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Governance</td>
<td>1.1 Changing to a more participative and inclusive democracy</td>
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<td></td>
<td>1.2 Promoting citizenship via co-creation and co-management</td>
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<td></td>
<td>1.3 Increasing the flexibility and resilience of governance models</td>
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<tr>
<td></td>
<td>1.4 Developing new planning tools for sustainable development</td>
</tr>
<tr>
<td>2. Economy</td>
<td>2.1 Improving the resilience of economic systems and adaptation to changes in global and local economies</td>
</tr>
<tr>
<td></td>
<td>2.2 Improving the sustainability and diversity of local economies in balance with the cities’ specialization</td>
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<tr>
<td></td>
<td>2.3 Managing adaptation to innovation and knowledge-based economies</td>
</tr>
<tr>
<td></td>
<td>2.4 Fostering human and social capital as a source of (technological) innovation</td>
</tr>
<tr>
<td></td>
<td>2.5 Fostering employment creation with high quality standards.</td>
</tr>
<tr>
<td>3. Mobility</td>
<td>3.1 Fostering sustainable accessibility and promoting sustainable, inclusive and healthy mobility</td>
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<tr>
<td></td>
<td>3.2 Developing or expanding a multimodal transport system</td>
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<td></td>
<td>3.3 Articulating mobility planning tools and policies with innovations in the sector</td>
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<tr>
<td></td>
<td>3.4 Reducing congestion</td>
</tr>
<tr>
<td>4. Environment</td>
<td>4.1 Reducing ecological footprint and pressure on ecosystems</td>
</tr>
<tr>
<td></td>
<td>4.2 Increasing efficiency in resource management and promoting circular economy</td>
</tr>
<tr>
<td></td>
<td>4.3 Developing eco-friendly urban environments</td>
</tr>
<tr>
<td></td>
<td>4.4 Fostering cities’ resilience to climate change</td>
</tr>
<tr>
<td>5. People</td>
<td>5.1 Adapting the city’s economic and social life to an ageing population</td>
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<tr>
<td></td>
<td>5.2 Promoting social inclusion, cohesion and equity</td>
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<tr>
<td></td>
<td>5.3 Enhancing the inclusion of migrants and refugees</td>
</tr>
<tr>
<td></td>
<td>5.4 Promoting equity in access to the labour market</td>
</tr>
<tr>
<td></td>
<td>5.5 Managing the population growth while reducing negative externalities</td>
</tr>
<tr>
<td></td>
<td>5.6 Creating adaptive education systems and labour market</td>
</tr>
<tr>
<td>6. Living</td>
<td>6.1 Eradicating spatial exclusion and promoting equity in access to housing and quality urban environments</td>
</tr>
<tr>
<td></td>
<td>6.2 Managing the quality of life in cities, ensuring access to services</td>
</tr>
<tr>
<td></td>
<td>6.3 Promoting interurban variety and cities’ identity by protecting cultural heritage</td>
</tr>
<tr>
<td></td>
<td>6.4 Fostering a healthy and clean region in which inhabitants stay healthy</td>
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<tr>
<td></td>
<td>6.5 Fostering a safe environment within the city</td>
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<tr>
<td></td>
<td>6.6 Ensuring online safety and security</td>
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</tbody>
</table>

Source: Author
3.5 Research approach and the information required

To be able to evaluate the bottom-up component of Amsterdam Smart City, it was deemed necessary to analyse several factors which would bring about an evaluation of the Amsterdam Smart City, its internal coherence and the bottom-up component of ASC. To do so, several questions had to be answered.

First, it was deemed important to determine whether the initiatives could be considered in line with the goals set by Amsterdam Smart City. Second, it was necessary to investigate who initiated each initiative, who was involved with the initiative and whether it could be considered a bottom-up endeavour. Third, the “smartness” of each initiative was checked by cross-referencing the ASC definition of “smart” with the information gathered on each initiative. Fourth, each initiative was investigated to which urban challenges they contributed.

For all these questions, a collection of information on each initiative was necessary before each consideration could be made. This required information on the goals, conception, methods, means, view and plans of each initiative, as well as the organization behind each initiative. For some, this information was more obvious than for others, as large-scale organizations or institutionally-induced initiatives required less in-depth review than those which were more closely related to bottom-up practices and depended on nuances.
Chapter four of this master thesis serves as an introduction to the case study under review, Amsterdam Smart City. The chapter starts with the birth of the first smart concept, Amsterdam Digital City, and how this may have paved the way for the modern-day Amsterdam Smart City concept. Section 4.2 explores the contents of this Smart Strategy and illustrates what goals ASC has set for itself, and through which means it aims to fulfil these goals. Section 4.3 gives an overview of various studies that have tried to measure the performance (or “smartness”) of Amsterdam Smart City. These assessments give an insight in the various ways in which one can judge a Smart City like Amsterdam, and what outcomes these different perspectives provide. The chapter ends with a conclusion in section 4.4.

4.1 Introduction
While the awareness of the cities’ environmental footprint began to grow since the 1990s, Amsterdam was one of the very first cities to think about a strategy to face pollution and energy consumption in urban areas (Dameri, 2017). The municipality of Amsterdam began to think about instruments and projects to face pollution, energy consumption and environmental quality in the city, and found the “Amsmarterdam city” project on this basis (Ibid.). Before that however in 1994 already, the city developed the Amsterdam Digital City concept that served mostly as a political and social instrument, to communicate and exchange political opinions, used to enforce citizens in the elections at that time (Ibid.).

The idea to develop a smart city program was conceived in 2009, thanks to the collaboration between the Amsterdam Innovation Motor, energy-network operator Liander and the municipality, who believed that ICT improves the way that cities function and as a result have become both the initiators of the Amsterdam Smart City as well as the main driving force behind this initiative (Dameri, 2017; Mora & Bolici, 2017). The top-down decision to transform Amsterdam into a smart city has been supported by both political commitment and a clear motive, namely the desire to use ICT for helping the city solve its environmental problems and building a sustainable urban environment (Mora & Bolici, 2017). According to the initiator of the Amsterdam Smart City programme, the essence of a Smart City in Amsterdam is that citizens are enabled to make smart choices and can be smart entrepreneurs (Baron et al., 2012).

Technology was identified as a key enabler to address climate issues and the smart city strategy has become an opportunity to achieve strategic objectives defined by the City of Amsterdam in a faster way (Ibid.). Amsterdam defines a smart city as “A smart city is a city in which social and technological infrastructures and solutions facilitate and accelerate sustainable growth, ultimately aiming to become a futureproof and liveable city” (Amsterdam Smart City [ASC], 2018-A). They continue by adding that “Intensive collaboration is necessary to create an open and fair social infrastructure between all stakeholders in the city. Technology plays an important role in the development of the smart city but is not a goal itself” (Ibid.).

4.2 The concept of ASC
During the planning phase, the smart city strategy has been included within the strategic framework of the city and aligned with its priorities for intervention, primarily focusing on the need to counter climate change through the reduction of CO₂ emissions. The ASC is closely linked to the New Amsterdam Climate [NAC] programme which states climate goals for the city of Amsterdam and wishes to encourage a change in the energy consumption of citizens. To maximize the result of this effort, the end users, who will have to make the energy transition are approached along two paths: 1) application of innovative technology results in a technology push to sustainable behaviour and 2) stimulation of behavioural change creates a demand pull for more sustainable technology (Baron et
While both individuals and businesses are willing to change, too little action has been taken, as required parties do not team up and the Amsterdam Smart City recognizes a gap between intentions and actions, for which it set up a platform to bring parties together and initiate actions (Ibid.).

As a result, the smart city strategy has been aligned with the objectives, priorities, and vision proposed in the NAC and the strategy looks forward to 2025, with its goals being 1) the reduction of energy wastage and CO\textsubscript{2} emissions in the metropolitan area of Amsterdam and 2) to promote sustainable economic growth based on (technological) innovation. (Mora & Bolici, 2017).

To achieve these goals, a specific approach has been defined based on the continuous and constant development of ICT-based projects, with four key principles being selected for guiding the development of both the strategy and individual projects (Mora & Bolici, 2017; Baron et al., 2012):

1) Collective effort: A highly collaborative approach is required for achieving results. For this reason, cooperation between the public and private sectors is stimulated and supported
2) Economic viability: Only the most beneficial projects can be considered for large-scale implementation
3) Tech push/pull demand: The action against climate change must be supported through technological innovation
4) Knowledge dissemination: Sharing and spreading the knowledge acquired.

Whereas other cities focus on technology, Amsterdam chooses an integrated and open approach in which collaboration is key (ASC, 2018-A). The Amsterdam Smart City concept focusses on public-private collaboration within their community, with a central role for citizens, who, according to ASC, should be involved to co-create solutions and make choices that fit their needs and wishes (Ibid.). Furthermore, they state that within creating smart city solutions the main challenge is finding the right solution for a specific problem without focusing on the solution only, and rather putting effort and thoughts in defining problems within the PPPP (public-private-people partnership) spheres (Ibid.). The end goal of the Amsterdam Smart City is to achieve paradigm shifts: (ASC, 2018-A).

- From Municipality to Community;
- From Centralized to Decentralized;
- From Top-down to Bottom-Up;
- From Assumptions to Information-Driven;
- From Planning to Design;
- From Ownership to Availability/Use;
- From Experimental Zones to the whole city as a Living Lab with Experiments.

On the website of Amsterdam Smart City, the following six smart themes are highlighted: Infrastructure & Technology; Energy, Waste & Waste; Mobility; Circular City; Governance & Education; and Citizens & Living (ASC, 2018-B).

The aim of the ASC platform is to keep together different categories of stakeholders, to build a quadruple helix able to create a regional knowledge network to enforce the smart city development in the future (Dameri, 2017). ASC is, according to Dameri (2017) explicitly involving not only the civil society through active participation of citizens and social bodies in defining the smart priorities and projects, but also declaring that active behaviour of citizens and knowledge sharing permits the successful smart implementation in urban spaces, which is derived from the strategic choice to “activate” the role of the citizens’ intellect, awareness and commitment, making citizens both shareholders as well as stakeholders of Amsterdam Smart City. A living lab approach is being used to
ensure the active involvement of citizens, as the tested technologies are useless without the publics’ acceptance and experience (Mora & Bolici, 2017). However, Dameri (2017) notes, even if the citizens are the final stakeholders of this urban strategy, they are often not aware of its existence.

Having stated the above, Dameri (2017) provides an analysis of 43 initiatives that made up the initiative portfolio of Amsterdam Smart City and found that out of 25 projects that can be considered “smart” (checked versus the “own” definition of Amsterdam Smart City), 16 out of these 25 are based on a strong participation of citizens, in either implementing technology in their homes to improve sustainability of private residences, or in modifying behaviour to reduce the environmental footprint of the city. Apparently, many projects are human-based, and the strategy could thus be perceived as human-based (which is not to be confused with being bottom-up), but still there is very little awareness among citizens, as can be concluded from the previous paragraph.

4.3 The “Smartness” of ASC

While there is no “one true” definition of Smart Cities, and almost all cities shape their own idea of what constitutes of a Smart City, it may be difficult to determine how smart a specific city is. Some authors (eg. Manville et al., 2014; Angelidou, 2017) have tried to measure the performance of Smart Cities by comparing them against each other, whereas other authors (eg. Fernandez-Anez et al., forthcoming; Monson, 2015; Dameri, 2017) have tested the claims of smartness by checking to what extent these smart strategies are internally coherent. The latter have done so by testing to what extent “smart” initiatives within a city, that are listed a smart by the city itself, are actually “smart” checked by the very definition of a smart city/project that the city itself uses. This research has tried to combine both measures, by doing desk research on the performance of Amsterdam Smart City compared to other European cities in three different ways, as well as the internal coherence of Amsterdam Smart City.

In an attempt to provide a clearer view of the defining characteristics of Smart City strategies, Angelidou (2017) identified and reviewed the characteristics of 15 Smart Cities (or Ven
tures) based on literature on smart cities. Based on this literature, 10 defining indicators (Technology, ICTs, and the Internet; Human and Social Capital Development; Entrepreneurship Promotion; Global Collaboration and Networking; Privacy and Security; Locally Adapted Strategies; Participatory Approach; Top-down Coordination; Explicit and Workable Strategic Framework; and Interdisciplinary Planning) have been identified and each of the 15 Smart Cities that fell within the scope of this body of research were “measured” on these ten indicators (Angelidou, 2017). In the 10 categories, Amsterdam stands out (both positively and negatively) in a few, as can be seen from Table 4:

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Performance and/or elaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Technology, ICTs and the Internet</td>
<td>Amsterdam is mentioned to have a very targeted – technologically speaking – strategic focus, and the city does not belong to the category of highly integrated, all-encompassing smart city strategies</td>
</tr>
<tr>
<td>Human and Social Capital Development</td>
<td>ASC is one of two cities in the category Human and Social Capital Development, that sets environmental sustainability/sustainable lifestyles as a goal, but ASC is</td>
</tr>
</tbody>
</table>

1 The 15 cities being: Amsterdam; Barcelona; London; PlanIT Valley; Stockholm; Cyberjaya; Singapore Intelligent Nation; King Abdullah Economic City; Masdar City; Skolkovo; Songdo IBD; Chicago; New York; Rio de Janeiro; Konzo.
unique in that it tries to achieve so through civil society (Ibid.).

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Description</th>
</tr>
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<tbody>
<tr>
<td>Entrepreneurship Promotion</td>
<td>Amsterdam Smart City scores quite well on Entrepreneurship Promotion.</td>
</tr>
<tr>
<td>Global Collaboration and Networking</td>
<td>ASC is one of the few ventures that has initiatives linked to Global Collaboration and Networking</td>
</tr>
<tr>
<td>Privacy and Security</td>
<td>No initiatives were defined linked to this Characteristic.</td>
</tr>
<tr>
<td>Locally Adapted Strategies</td>
<td>ASC manages to portray a strategy that is ingrained in the local needs.</td>
</tr>
<tr>
<td>Participatory Approach</td>
<td>Interestingly, on the topic of Participatory Approaches, Amsterdam is not mentioned as a strategy which was planned through participatory processes from the outset but is mentioned as one of the cities that does have a broad involvement of citizens and businesses in test-driving new technologies</td>
</tr>
<tr>
<td>Top-down Coordination</td>
<td>Contrary to most other cities, Amsterdam Smart City is being driven by both Local Government and the private sector, while most smart cities are overwhelmingly driven by the public sector</td>
</tr>
<tr>
<td>Explicit and Workable Strategic Framework</td>
<td>ASC is one of the few cities that has multiple phases in their strategy, and in which projects can “grow” from small scale testing to large scale roll out.</td>
</tr>
<tr>
<td>Interdisciplinary Planning</td>
<td>Amsterdam Smart City is one of the Smart City Strategies that use multi-layer expertise to develop an integrated smart city initiative.</td>
</tr>
</tbody>
</table>


Based on the analysis done by Angelidou (2017), Amsterdam Smart City is to be considered not as one of the top performing Smart Cities, but still doing rather well. ASC lacks an all-encompassing strategy and does not have a single initiative concerning privacy and security. Furthermore, Angelidou (2017) states that the Amsterdam Smart City concept was not created through participation with stakeholders, but rather as a top-down concept, which is interesting since Amsterdam very much wants to be a bottom-up smart city. If one aims to do so, it would make sense to develop the concept through (collaboration with) the bottom-up component, but that didn’t happen according to this analysis. However, ASC deserves some merit too, as it provides an excellent strategic framework for the development and rolling out of initiatives on a large scale, has a concept driven by both the public as well as private sector and uses interdisciplinary planning to provide an integrated Smart City concept.

The European Parliament’s Committee on Industry, Research and Energy commissioned a mapping on Smart Cities in the EU in 2014, which was carried out by Manville et al. (2014) (see also section 3.2.6). Amsterdam was one of the cities that was part of this research, and deemed one of the six most successful smart cities, and as such analysed in-depth by Manville et al. (2014).

First, the number of initiatives and the number of characteristics included per initiative were measured. It turns out that Amsterdam Smart City has all six characteristics\(^2\) covered within its smart initiatives, and ASC the highest average number of characteristics per initiative, with just under 3.5, has a great variety of characteristics and a high number of initiatives compared to other European

\(^2\) The six characteristics being: Smart Living, Smart Economy, Smart Environment, Smart Government, Smart People and Smart Mobility, as introduced by Giffinger et al., 2007 and used throughout this study.
cities (Manville et al., 2014). In their measurement, Amsterdam comes out on top as the best performing Smart City, with not only a high number of characteristics per initiative, but also having a strategy relevant to the city’s Europe2020 goals (Ibid.). Interestingly, Manville et al. (2014) note that most of the projects implemented in the ASC dealt with energy management systems as these tend to create the most impact, because businesses are more sensitive to energy costs than consumers. This is interesting primarily because, as we’ve seen in section 4.2, ASC mainly aims to encourage an energy consumption change in citizens.

TUWIEN launched a platform on which Smart City performances can be compared, and in 2015 released a version which included European cities of 300,000 to 1 million inhabitants. Within this platform, the TUWIEN aims to rank and benchmark medium-sized cities, while perceiving Smart Cities according to the definition by Giffinger et al. (2007), which is unsurprising as he is part of the team. While the authors admit that each ranking uses their own method and produces different results, and they address this issue, they do not explicitly state why their measurement is more useful than others, other than that medium-sized cities are not often considered (Fachbereich Stadt- und Regionalforschung [FSR], 2015).

Figure 10 shows the result of their analysis, comparing Amsterdam to Copenhagen and the average of medium-sized cities in Europe that were included in the study. In general, Amsterdam seems to perform better than most cities, with only the Smart Environment dimension being close to the average, and thus indicating the city should improve in that characteristic (FSR, 2015). However, the city of Copenhagen manages to outperform Amsterdam in three characteristics, Smart People, Smart Governance and Smart Environment (Ibid.). In their method, FSR (2015) used an average of 0 for each
characteristic, with a standard deviation of 1. Before these results can be interpreted, a few things must be considered. The FSR weighed their indicators based on coverage, meaning that indicators that are present in more cities are weighed stronger than those indicators that are only present in a select few.

Table 5 shows the individual indicators FSR tested for, and the scores for Amsterdam Smart City, as given by FSR (2015), with special attention to performances below the average (in red) and two times the standard deviation (in green).

**Table 5: The performance of Amsterdam Smart City**

<table>
<thead>
<tr>
<th>Smart Economy</th>
<th>Smart Governance</th>
<th>Smart Mobility</th>
<th>Smart Environment</th>
<th>Smart People</th>
<th>Smart Living</th>
</tr>
</thead>
<tbody>
<tr>
<td>Innovative Spirit (0.486)</td>
<td>Political awareness (1.386)</td>
<td>Local Transport System (0.608)</td>
<td>Air Quality (No pollution) (0.209)</td>
<td>Education (2.456)</td>
<td>Cultural and leisure facilities (1.133)</td>
</tr>
<tr>
<td>Entrepreneurship (0.68)</td>
<td>Public and social services (-0.391)</td>
<td>(International accessibility (1.773)</td>
<td>Ecological Awareness (0.725)</td>
<td>Lifelong Learning (0.866)</td>
<td>Health conditions (0.596)</td>
</tr>
<tr>
<td>City Image (2.391)</td>
<td>Efficient and transparent administration (0.896)</td>
<td>ICT-Infrastructure (1.88)</td>
<td>Sustainable Resource Management (-0.044)</td>
<td>Ethnic Plurality (0.118)</td>
<td>Individual security (-0.177)</td>
</tr>
<tr>
<td>Productivity (0.462)</td>
<td>Sustainability of the Transport System (0.813)</td>
<td>Open-mindedness (0.674)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Labour Market (1.138)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>International Integration (4.407)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average: 1.624</td>
<td>Average: 0.63</td>
<td>Average: 1.268</td>
<td>Average: 0.297</td>
<td>Average: 1.029</td>
<td>Average: 0.506</td>
</tr>
</tbody>
</table>

Source: FSR, 2015.

As can be seen in both figure 10 and table 5, Amsterdam performs best in the Smart Economy characteristic according to FSR (2015). This is mainly due to the city scoring exceptionally well in the “International Integration” parameter. In four indicators, ASC scores less than the average. It should be noted that scoring better than others is merely that, a better score compared to other cities, and not an indicator of smart performance. While a higher score is deemed better by FSR (2015), it is questionable to what extent this says anything about the Smart City itself, or rather the position compared to other cities. Having a higher score could imply the city is “Smart” according to this indicator but could also be the result of other cities underperforming and the relative score being lifted.
From these three studies (Angelidou, 2017; Manville et al., 2014; FSR, 2015) one could conclude that not only the concept of a Smart City may be fuzzy, but also the way in which we perceive a Smart City, and what exactly indicates this “smartness”. The assessment of Smart City performance is thus highly dependant on the perspective with which one looks at these Smart Cities. In these examples, all authors look at various indicators to measure the performance of ASC compared to other European Smart Cities, and while a select group of indicators is coherent among these authors, some are prevalent in Angelidou (2017) and absent in FSR (2015) for example, and vice versa. Interestingly, Angelidou (2017) notes the promotion of entrepreneurship as one of the categories in which ASC scores rather well, but the score for entrepreneurship according to FSR (2015) is not impressive. Both studies find that Amsterdam does well in terms of International Networking and Integration.

In the work done by Manville et al. (2014) Amsterdam comes out as the smartest city, whereas in the study by Angelidou (2017) it ends up somewhere in the middle of the pack, and in the case of FSR (2015), one could argue for both Copenhagen as well as Amsterdam, which can be seen in figure 10. While these studies give an overview of the performance of ASC, there is no irrefutable evidence where Amsterdam ranks among other Smart Cities, and which indicators are the most likely to present data on the “real Smart City performance”. One should understand that the fact that a city performs in a certain way, under the label of a Smart City, doesn’t necessarily mean that the Smart City programme had any impact on that performance whatsoever. Looking at the transportation system for example, Amsterdam does well, and therefor receive a high score, but the fundaments for this transportation system and the way people commute from A to B have been laid years ago.

The assessment done by FSR (2015) is measuring how well the Amsterdam Smart City is performing, using indicators that may very well precede the Smart City concept, which was only devised in 2009. It is questionable what effect a “minor” strategy like a Smart City programme could have on the performance of a city within five years of its creation. What Manville et al. (2014) did may be very superficial in terms of analysis but provides us with a better overview of the impact of this Smart City Concept, albeit initiatives may have been created regardless of the Smart City Strategy. It shows which characteristics of a Smart City are currently present in Amsterdam, and to what extent. While FSR (2015) studied the “outcomes” or performance of ASC, Angelidou (2017) analysed the Smart City Strategy that ASC incorporates. This ensures that the image that is being created is solely based on the cities’ smart strategy and how it seeks to utilize the Smart concept. However, much can happen between the creation of a strategy and the actual implementation. As a result, Angelidou (2017) studies the Smart City concept, but is unable to assess the impact of ASC. The smartness of a city or its strategy is thus up for interpretation, as the aspect at which you look determines what part of the smart city concept will be judged.

4.4 Conclusion
Chapter 4 has served as an introduction to the Amsterdam Smart City case, and has discussed the emergence of the platform, which subjects it focusses on and why, and how this Smart City is perceived compared to other European Smart Cities. To start with the latter, it turns out the perception of a Smart City may just be as personal as the definition one uses to describe a Smart City. Not only are Smart Cities diverse in nature, so is the way we view them, judge them and compare them amongst each other. Furthermore, the way one assesses the Smart City very much influences the outcomes, as looking at the strategy may provide a very different image compared to the “results” of what one deems to be a Smart City. Paired with the fact that most Smart City Strategies are recent and thus not very likely to have made a large impact so far, this makes it more difficult to assess the “smartness” of a city. A good strategy doesn’t necessarily imply that changes will be made, and good performance is not solely the result of the Smart City concept.
While works of Giffinger et al. (2007) and the likes have brought us closer to finding one way to assess Smart Cities, it seems that within these six characteristics much is still up for debate. Furthermore, one may use these characteristics to evaluate a strategy, identify initiatives or assess the “impact” the Smart City has had on the performance of the city. Using one of these methods will result in a one-sided view of the Smart City and how is performing but does not warrant a verdict over the entire concept.
5. Results and Discussion

5.1 Introduction
In this chapter, the findings of the analysis will be presented. The data will be presented in five short and comprehensible tables, alongside a single graph after which the findings and the implications of these findings shall be discussed in section 5.3.

5.2 Presentation of the data
At the time of writing, Amsterdam Smart City consisted of 254 projects divided over 6 themes. While some of these initiatives can be classified as sub-projects under bigger projects, and others overlap partially, all 254 initiatives can be considered unique. As three projects had no information available, these have been excluded from the analysis, leaving 251 of these initiatives which been analysed to see whether they lined up with the goals set by Amsterdam Smart City, whether they could be considered smart (according to the definition set by ASC), whether they could be considered bottom-up initiatives and which of the 29 urban challenges (as portrayed in table 3) these initiatives cater to. To enhance the readability of this analysis, Annex A contains the data used for this analysis, while Annex B provides additional information on each initiative, such as a short description and a listing of partners involved.

Table 6: A breakdown of initiatives in Amsterdam Smart City per theme

<table>
<thead>
<tr>
<th>Theme</th>
<th>Number of initiatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure &amp; Technology</td>
<td>40</td>
</tr>
<tr>
<td>Energy, Water &amp; Waste</td>
<td>53</td>
</tr>
<tr>
<td>Mobility</td>
<td>27</td>
</tr>
<tr>
<td>Circular City</td>
<td>52</td>
</tr>
<tr>
<td>Governance &amp; Education</td>
<td>29</td>
</tr>
<tr>
<td>Citizens &amp; Living</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total number of initiatives</strong></td>
<td><strong>251</strong></td>
</tr>
</tbody>
</table>

Source: Author

As can be seen in table 6, the themes “Energy, Water & Waste”, “Circular City” and “Citizens & Living” are dominant in the Amsterdam Smart City, while “Mobility” and “Governance & Education” have the fewest projects.

As Mora & Bolici (2017) portrayed, Amsterdam Smart City set two goals that it aims to achieve through the ASC Concept:

1) The reduction of energy wastage and CO₂ emissions in the metropolitan area of Amsterdam
2) To promote sustainable economic growth based on (technological) innovation.

The three projects that were removed can still be found in Annex A and B, under the numbers #84, #118, and #228. These three projects fall under the themes “Energy, Water & Waste”, “Mobility” and “Citizens & Living” respectively.
Table 7: Initiatives in Amsterdam Smart City versus ASC goal #1

<table>
<thead>
<tr>
<th>Theme</th>
<th>In line with goal #1</th>
<th>Not in line with goal #1</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure &amp; Technology</td>
<td>8 (20%)</td>
<td>32 (80%)</td>
<td>40</td>
</tr>
<tr>
<td>Energy, Water &amp; Waste</td>
<td>31 (58%)</td>
<td>22 (42%)</td>
<td>53</td>
</tr>
<tr>
<td>Mobility</td>
<td>10 (37%)</td>
<td>17 (63%)</td>
<td>27</td>
</tr>
<tr>
<td>Circular City</td>
<td>13 (25%)</td>
<td>39 (75%)</td>
<td>52</td>
</tr>
<tr>
<td>Governance &amp; Education</td>
<td>0 (0%)</td>
<td>29 (100%)</td>
<td>29</td>
</tr>
<tr>
<td>Citizens &amp; Living</td>
<td>5 (10%)</td>
<td>45 (90%)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total number of initiatives</strong></td>
<td><strong>67 (27%)</strong></td>
<td><strong>184 (73%)</strong></td>
<td><strong>251</strong></td>
</tr>
</tbody>
</table>

Source: Author

Table 7 shows an overview of initiatives per theme, and whether these initiatives contribute to the goal #1. Out of all 251 initiatives, only 67 (27%) can be considered in line with ASC goal #1. 46% of the initiatives that are in accordance with goal #1 fall under the theme “Energy, Water & Waste”. “Circular City” has 19% of the shares, while “Mobility” makes up for 15% of all initiatives that work towards achieving a reduction in both energy wastage and CO₂-emissions. The other 184 initiatives do not contribute to goal #1 and are primarily thematized under “Citizens & Living” (24%); “Circular City” (21%) and “Infrastructure & Technology” (17%).

Table 8: Initiatives in Amsterdam Smart City versus ASC goal #2

<table>
<thead>
<tr>
<th>Theme</th>
<th>In line with goal #2</th>
<th>Not in line with goal #2</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure &amp; Technology</td>
<td>6 (15%)</td>
<td>34 (85%)</td>
<td>40</td>
</tr>
<tr>
<td>Energy, Water &amp; Waste</td>
<td>28 (53%)</td>
<td>25 (47%)</td>
<td>53</td>
</tr>
<tr>
<td>Mobility</td>
<td>4 (15%)</td>
<td>23 (85%)</td>
<td>27</td>
</tr>
<tr>
<td>Circular City</td>
<td>16 (31%)</td>
<td>36 (69%)</td>
<td>52</td>
</tr>
<tr>
<td>Governance &amp; Education</td>
<td>1 (3%)</td>
<td>28 (97%)</td>
<td>29</td>
</tr>
<tr>
<td>Citizens &amp; Living</td>
<td>2 (4%)</td>
<td>48 (96%)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total number of initiatives</strong></td>
<td><strong>57 (23%)</strong></td>
<td><strong>194 (77%)</strong></td>
<td><strong>251</strong></td>
</tr>
</tbody>
</table>

Table 8 shows an analysis like Table 7, focusing on ASC Goal #2 instead. The majority (77%) of projects does not seem to be in coherence with goal #2. Of the 58 initiatives that are in line with goal #2, almost half (49%) fall under the theme “Energy, Water & Waste”, and just over a quarter (28%) under the theme “Circular City”.

Like many others, the city of Amsterdam has its own vision of what constitutes of a smart city, and the definition they utilize is the following: “A smart city is a city in which social and technological infrastructures and solutions facilitate and accelerate sustainable growth, ultimately aiming to become a futureproof and liveable city” (ASC, 2018-A). This definition bears great resemblance to goal #2, and there for many projects that contribute to goal #2 can also be considered Smart, using the view of ASC.
Table 9: Initiatives in Amsterdam Smart City and their Smartness

<table>
<thead>
<tr>
<th>Theme</th>
<th>“Smart” projects</th>
<th>“Non-Smart” projects</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure &amp; Technology</td>
<td>5 (12%)</td>
<td>35 (88%)</td>
<td>40</td>
</tr>
<tr>
<td>Energy, Water &amp; Waste</td>
<td>28 (53%)</td>
<td>25 (47%)</td>
<td>53</td>
</tr>
<tr>
<td>Mobility</td>
<td>4 (15%)</td>
<td>23 (85%)</td>
<td>27</td>
</tr>
<tr>
<td>Circular City</td>
<td>16 (31%)</td>
<td>36 (69%)</td>
<td>52</td>
</tr>
<tr>
<td>Governance &amp; Education</td>
<td>1 (3%)</td>
<td>28 (97%)</td>
<td>29</td>
</tr>
<tr>
<td>Citizens &amp; Living</td>
<td>2 (4%)</td>
<td>48 (96%)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total number of initiatives</strong></td>
<td><strong>56 (22%)</strong></td>
<td><strong>195 (78%)</strong></td>
<td><strong>251</strong></td>
</tr>
</tbody>
</table>

Source: Author

Table 9 shows that there is indeed a similarity in amount of initiatives that comply with goal #2 and those which can be considered smart by the definition set by ASC. Coincidentally, the amounts are the same for both Goal #2 and “Smartness”, while there is a minor difference in the exact projects that make up these amounts.

Furthermore, each project has been analysed to find out whether they can be considered “bottom-up”, and the result of this analysis can be found in Table 10

Table 10: Bottom-up and other initiatives in Amsterdam Smart City

<table>
<thead>
<tr>
<th>Theme</th>
<th>Bottom-up</th>
<th>Other</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Infrastructure &amp; Technology</td>
<td>0 (0%)</td>
<td>40 (100%)</td>
<td>40</td>
</tr>
<tr>
<td>Energy, Water &amp; Waste</td>
<td>3 (6%)</td>
<td>50 (94%)</td>
<td>53</td>
</tr>
<tr>
<td>Mobility</td>
<td>2 (7%)</td>
<td>25 (93%)</td>
<td>27</td>
</tr>
<tr>
<td>Circular City</td>
<td>2 (4%)</td>
<td>50 (96%)</td>
<td>52</td>
</tr>
<tr>
<td>Governance &amp; Education</td>
<td>1 (3%)</td>
<td>28 (97%)</td>
<td>29</td>
</tr>
<tr>
<td>Citizens &amp; Living</td>
<td>2 (4%)</td>
<td>48 (96%)</td>
<td>50</td>
</tr>
<tr>
<td><strong>Total number of initiatives</strong></td>
<td><strong>10 (4%)</strong></td>
<td><strong>241 (96%)</strong></td>
<td><strong>251</strong></td>
</tr>
</tbody>
</table>

Source: Author

The results from this analysis show that an absolute minority of initiatives (4%) is considered bottom-up. The overwhelming majority (96%) consists of a mix of initiatives that are purely top-down or contain some bottom-up elements but can’t be considered purely bottom-up.
Table 3 gives an overview of all Urban Challenges that were recognized in one or more of the 251 initiatives. The challenges in the field of the Environment are most recognized in Amsterdam Smart City, with 195 counts of initiatives reacting to one (or more) of the four challenges in this field. Challenges 4.1 (*Reducing ecological footprint and pressure on ecosystems*), 4.2 (*Increasing efficiency in resource management and promoting circular economy*) and 1.2 (*Promoting citizenship via co-creation and co-management*) were most present in ASC, while challenge 5.5 (*Managing the population growth while reducing negative externalities*) was mentioned only once.

Annex F provides nineteen charts, which show the division of Urban Challenges per ASC theme, and vice versa. Because the environmental urban challenges can be considered an outlier, Annex F provides two charts for each theme, one in which all urban challenges are included, and one in which the environmental challenges are left out to increase the comprehensibility of each chart.

These charts show that Environmental urban challenges are the most addressed issues in the themes “Infrastructure & Technology”, “Energy, Water & Waste” and “Circular City”. Both “Governance & Education” and “Citizens & Living” address mostly urban challenges in the People dimension, and for “Mobility” the most common urban issues are related to mobility.

5.3 Data interpretation
The five tables, alongside a single graph, presented in section 5.2, while concise, provide an interesting overview of Amsterdam Smart City. This section aims to expand on the findings, to explain why these results have been found and what the implications of these findings may be.

5.3.1 Initiatives and the goals of Amsterdam Smart City
The first element that will be discussed is the link between the goals that ASC set (Mora & Bolici, 2017) and the initiatives mentioned in ASC.
It appears that many, if not most, of the initiatives are not in line with neither goal #1 nor goal #2. Only a little over a quarter of all initiatives contributed to goal #1 of Amsterdam Smart City. Because of the nature of this goal, it makes sense that most of these initiatives fall under either “Energy, Water & Waste” or “Circular Economy”. One could argue that goal #1 is rather narrow, as it focuses only on the reduction in energy wastage and CO₂-emissions. Resource efficiency (or “closing the loops”), which is a recurring subject in “Circular Economy” for example, is not considered under this goal commonly associated with energy wastage.

Goal #2 is more closely related to what Amsterdam Smart City consider “Smart”. However, only 23% of all initiatives contribute to the promotion of sustainable economic growth based on (technological) innovation. Most of these initiatives are, like goal #1, initiatives that are considered part of “Energy, Water & Waste” or “Circular Economy”. It seems that these two themes are most closely related to what Amsterdam themselves consider smart approaches and building blocks to a smart city.

Especially the themes “Governance & Education” and “Citizens & Living” appear to contain many initiatives that seem to be disconnected from the ASC Goals. Looking at a few of these projects provides some more insight. The theme “Citizens & Living” contains a few initiatives aimed at the elderly, the sharing economy, social cohesion or healthy living, which are subjects that, while they can be beneficial to the city, do not fall under the ASC Goals. Some examples include projects “Age Friendly Amsterdam” (#215), “Sharing Economy” (#217), “VITAMINE” (#218), “PostNL Mailmen inform citizens about activities in the neighbourhood” (#227) and “Positive Health in Jeruzalem”(#234). All these projects (and others) as well as additional information can be found in Annex A and Annex B under the corresponding project number.

The theme “Governance & Education” covers various ways of encouraging entrepreneurship, encouraging youngsters and labour market adaptation through projects such as “Startup in Residence” (#175), “Kiezen voor Kansen – JINC” (#185) and “Labor Placement new style: it’s all in the game” (#195). While, again, these projects may prove to be beneficial for the City of Amsterdam, they are not in line with the ASC goals.

However, some projects are most certainly in line with either one goal, or even both. While the first goal is rather straight-forward whether a project contributes to this goal, for the second goal it is less obvious. “Buiksloterham – Learning beyond urban experiments from Living Labs – AMS Institute” (#168) is one of the projects that adheres to both goals. Besides being a living lab for experiments with renewable energy and circularity, this project has an explicit focus on “upscaling” and being a springboard for other circular activities, clearly indicating its promotion of sustainable economic growth based on innovation. “PUMA – Prospecting the Urban Mines of Amsterdam” (#137) is not directly contributing to goal #1 but does contribute to goal #2 as it focused on the availability of metals in the built environment, and whether these metals could be extracted from this so-called urban mine, to be used in new developments. A third example is “EV Energy” (#115) which is an INTERREG project which aims to implement policies favouring sustainable energy and electric mobility systems in cities. Amsterdam is one of the lead partners in this project, where policies for the reduction of energy wastage and CO₂-emissions are not only tested, but actively implemented through the Kansen voor West program.

5.3.2 Initiatives and the Smartness of Amsterdam Smart City
Table 9 shows that only 56 out of 251 initiatives which are part of ASC can be considered “Smart” if we use the definition of a smart city as used by Amsterdam and the Amsterdam Smart City itself. While there is a large overlap between goal #2 and the definition set by ASC, one importation addition to the definition is the inclusion of “aiming to become a futureproof and liveable city”. Projects are thus only smart if they do not only promote sustainable economic growth, but also must contribute to a
liveable and futureproof city. This (albeit for some) minor distinction leads to a few differences in practices that complied with goal #2 but are not considered “smart”. The prime example being “Amsterdam Innovation ArenA” (#1), which leads to sustainable growth for the ArenA, but not necessarily to a more liveable and futureproof city, as most, if not all innovations within this project are aimed at the stadium and the stadium experience.

Only 22% of all initiatives can thus be regarded as “smart” going by the definition Amsterdam uses, however, many more projects use the word smart in either their description or project name. One of these examples is the “Startupbootcamp Smart City & IoT” (#177), which is hosted by a global organization, and as such can be expected to carry a different connotation to their use of Smart City. However, Amsterdam Smart City and the city of Amsterdam themselves are involved in various projects that use the term “Smart City” in a way ASC does not. Examples are the aforementioned “Amsterdam Innovation ArenA” (#1), “Smart Entrepreneurial Lab” (#178), “Smart Citizen Kit” (#209). As it turns out, not even the organization behind ASC is consequent in its use of Smart.

5.3.3 Initiatives and Bottom-up in Amsterdam Smart City

While being revered as one of the most bottom-up Smart Cities in the world, the analysis done for this piece of research shows otherwise. Only a mere 10 initiatives were found to be true bottom-up initiatives. Several possible explanations can be given. First, the definition of bottom-up practices used in this research is rather strict. Either a project is bottom-up in all its aspects, or it is not. However, ASC underlines this themselves, as they state “There is a central role for citizens. What is a Smart City without Smart Citizens! They should be involved to co-create solutions and make choices that fit their needs and wishes” (Amsterdam Smart City, 2018-A). However, projects like the “Smart Citizen Kit” (#209) strongly correlate with the findings of Dameri (2017), which suggest that at the time of his research, many projects in Amsterdam Smart City depended on citizens as participants. Projects that originated from civil organisations, citizens and entrepreneurs are sparse in this current concept. Perhaps the view that ASC and many others have on what is bottom-up in Amsterdam Smart City is one they constructed as being “bottom-up” or bottom-up in theory, but practically turns out to be mostly top-down, or just containing some elements of bottom-up.

Besides a clear difference in definition, another option would be that there are in fact a lot of bottom-up initiatives in Amsterdam, but somehow these are not related to Amsterdam Smart City, but widely perceived as one of the main strong and distinguishing characteristics of Amsterdam Smart City. A number of these bottom-up initiatives outside of ASC have been analysed because of the findings discussed above. Annex G shows the result of this analysis, with a short description of each project and an explanation of whether they can be considered truly “bottom-up” according to this study can be found in Annex H.

This indexation shows that there most certainly are bottom-up initiatives in Amsterdam, and it provides some insight in the different ways “bottom-up” are perceived. In initiatives #1 to #36 (which can be found in Annex G and H), there is a clear focus on projects initiated by non-institutional parties, often civil movements or individuals. Social entrepreneurship is a term which was used often. Within this view, these are the indicators of what is a bottom-up initiative.

However, only a few projects, e.g. “Leven Lang in Plan Berlage” (#11), “De Kolenkit Centrale” (#4) and “Chef het Samen” (#17) mention co-creation or co-ownership. While on the other hand projects #37 to #45 almost all can be considered truly bottom-up according to the definition used in this research project.
5.3.4 Initiatives and Urban Challenges in Amsterdam Smart City

Testing all initiatives against the identified urban challenges for Amsterdam shows a large bias in themes on which Amsterdam Smart City focusses. The environment, followed by Governance, are the fields which are most commonly addressed.

Given the nature of ASC, its origin and conception in line with the NAC and three of the themes in Amsterdam Smart City being related to the environment, this doesn’t come as a surprise. However, the lack of “other subjects” being addressed is interesting. Out of 251 initiatives, only 6 out of 29 total urban challenges are counted as to be addressed more than 20 times (see Figure 11). A few arguments could be made to explain this. For example, the list of Urban Challenges could be incorrect. While it has sprung from previous articles and tailored to the city of Amsterdam through both desk research as well as consultation with two initiatives in Amsterdam and can thus be expected to at least be partially fitting on the case of Amsterdam.

However, there are three main hypotheses that stem from this point. The first is that there is a distinction between urban challenges that can be addressed by non-top-down parties, and those that are (primarily) in the hands of institutional organizations. Take for example urban challenges 2.1 and 2.2, which are both aimed at strengthening the local economic climate. This seems to be more complicated for non-institutional parties to engage in than environmental issues such as reducing energy wastage. Second, perhaps non-institutional initiatives focus on those issues that are more apparent and “popular” right now, which gives them a broader base for understanding and cooperation. Third is that the urban challenges identified are not those that are important to the city and those who live and work in the city, and they have priorities besides those identified prior to this analysis.

An interesting debate that may evolve from these findings is perhaps contrary to what sprouted this research in the first place, which is the importance of bottom-up for the functioning of smart cities. However, looking at these three hypotheses, and assuming (parts) of what Monzon (2015) identified as Urban Challenges for European cities is correct, there seems to be a discrepancy between the challenges faced (and identified) by bottom-up components and those that are identified from the outside. Perhaps, where many believed bottom-up is a crucial component to successful Smart Cities, there are (many) aspects which cannot (or will not) be addressed by bottom-up initiatives, as they are (based on the three hypotheses above) either: 1) Too difficult to engage in for bottom-up initiatives; 2) not interesting enough for bottom-up initiatives to engage in or; 3) Not seen as challenges by the bottom-up initiatives.

5.4 Conclusion

The analysis performed in this research has given a large amount of insight into the Amsterdam Smart City. Judging by their own standards, ASC appears to be not half as smart as they claim, in fact, less than a quarter of the initiatives portrayed by ASC meet the standards for “smart” set by ASC itself. And for one of the leading bottom-up smart cities (ASC, 2016) only 4% of the initiatives seems to be strictly bottom-up.

While a large number of these claims could be attributed to the perspective with which the researcher viewed Amsterdam Smart City and its initiatives, a more open view or less strict definition of bottom-up wouldn’t result in a major increase in the “smartness” or “bottom-up percentage” of ASC. Furthermore, it wouldn’t change that which is happening in Amsterdam, regardless of whether it is being called “smart” or not. While the concept of Amsterdam Smart City has sprouted certain initiatives, which are the direct result of ASC, many of the changes and projects can’t be directly linked to Amsterdam Smart City. There is a certain historical component and a sense of “lock-in” that has shaped the direction Amsterdam took. The environmental focus of ASC for example, which does not
only appear throughout the official themes, but also in the urban challenges that many initiatives under ASC can be linked to, is a result of historical events and the close linkage to the NAC.

A similar tale can be told for bottom-up initiatives in Amsterdam. While they are revered in literature on Smart Cities all over the world, very few of these appear to be part of the “official smart city”. While further research has shown that there is an array of bottom-up initiatives outside of the Smart City, these often can’t be regarded as “smart” according to the definition set by ASC. The result can be considered both bizarre and, at the same time, surprisingly predictable. While Amsterdam is seen as one of the prime smart cities in the world, with a huge emphasis on its bottom-up component, the smart city seems to be a hollow shell. The initiatives profit from the smart label, but strictly do not adhere to that very label, while the bottom-up initiatives for which the smart label is so glorified mainly seem to fall outside of the scope and reach of the smart city concept.
6. Conclusions

6.1 Introduction
Through an exploration of the vague concept of Smart Cities, and what makes a successful smart city, the importance of a bottom-up component was identified through literature. Using Amsterdam, one of the top candidates when it comes to bottom-up, was used as a case study to study the real-life case of a Smart City, and how bottom-up takes shape in this, according to many, prime example. This final chapter will provide an overview of the findings of this body of research, the implications which these findings bring along for both academia and policy and provide some insight into new strands of research which have opened throughout this exercise.

6.2 Main findings
While the Smart City concept has by some been praised as the one true solution to urban issues for modern-day cities, others blame its lack of transparency and content for creating an arms race in which each city wants to top “smart” rankings, while failing to connect to the actual issues going on in and around the city. Within this environment, the exploration of the concept of Smart Cities has started with an intricate conceptual model of what a Smart City is. While many do not agree on the definition and components of a Smart City, a clear line has been identified through the work of Giffinger et al. (2007) and those who built upon their model, ultimately resulting in the conceptual model created by Fernandez-Anez et al. (forthcoming), which can be seen in Figure 7, which has been used as a baseline for this body of research.

As implied before, there are many who oppose the current thinking on Smart Cities and wish to change the ongoing narrative. By identifying all these forms of critique and probable solutions to negate or diminish the negative effects of Smart City approaches, a solution was identified through a literature study which mostly pointed in the same direction, the direction of a bottom-up component to Smart Cities to form effective Smart Cities, rather than the (implied) detrimental top-down approach many of these smart cities are implicated to apply.

The city of Amsterdam, and the Amsterdam Smart City concept seems heavily influenced by the debate and contains all six domains mentioned by Giffinger et al. (2007), as well as the three components identified by Nam & Pardo (2011), although ASC insists technological factors should be a means and not an end-goal. Furthermore, it is widely revered as one of the most successful and most bottom-up smart cities in the world. Both in terms of fitting the conceptual model and the city which is furthest with bottom-up, the supposed “cure” to negative effects of smart cities, the city of Amsterdam seemed to be a perfect case study for modern-day Smart Cities and the role of bottom-up in smart cities.

Through an extensive analysis of both practices within the Amsterdam Smart City concept as well as bottom-up initiatives that were not a part of ASC, an analysis of the state of Amsterdam Smart City, as well as the concept of Smart Cities and the Bottom-up component in it, based on one of the worlds’ leading Smart Cities has been made. After analysing the various ways in which Amsterdam has been “ranked” as a Smart City before, it was determined that the best way to measure how Smart the concept is, was by applying the harshest critique, perhaps best worded by Vanolo (2013), and checking the concept against its own definitions, to give an accurate overview of the state of Amsterdam Smart City without being able to reason that they understood and applied the concept of a Smart City in a different way.

After analysing ASC, it turns out that not even a quarter of all initiatives that fall under ASC adhere to the “smart” definition that ASC itself applies. In some cases, this incongruity can even be addressed...
to the ASC itself, as it actively takes part in various “smart” projects that are not in line with their own vision on what is smart, or what contributes to a smart city. On the topic of bottom-up, only 4% of all initiatives can be considered truly bottom-up, most of which, again, do not line up with the definition of smart. One could thus argue that both the claims of being a smart city as well as a bottom-up (smart) city are incorrect.

While these findings do not directly impact the state of Amsterdam or Amsterdam Smart City, nor the projects that are taking place and shaping the city, it does influence the debate on Smart Cities. If one of the top Smart Cities turns out to not be as smart as it is claimed to be, checked against its own definition, what is the true value of a “Smart” label? And what does the lack of bottom-up initiatives in Amsterdam Smart City say about the importance of a bottom-up component in smart cities, as often implied in the literature?

6.3 Implications for academia and policy

This section will discuss the implications of the findings of this research for both academia and policy, to further enhance the knowledge on Smart Cities and bottom-up components in Smart Cities, as well as policy advice for Amsterdam to improve its Smart City

6.3.1 Implications for Academia

One of the weaknesses of many Smart City articles is that they seem to construct their view of a Smart City around an ideal-type smart city and fail to consider “real” smart cities. Section 2.4 of this thesis was used both to counter this weakness, and as an introduction to the criticism on Smart Cities. What this section intended to show was the difference between the theoretical concept of Smart Cities and how these are applied in real life. Many articles mentioned in the criticism on Smart Cities (section 2.5) fail to address these real-life applications of Smart Cities, and rather build on the theoretical concept of Smart Cities.

What this thesis has shown is that a part of the criticism these criticasters voice is legit and grounded, as one of the prime examples of Smart Cities seems to lack in these very departments. Capdevila & Zarlenga (2015), among others, pointed out the “dangers” of the private sector buying themselves into the Smart City. Looking at Annex B, which shows all firms associated with projects, many commercial parties are involved with the initiatives of Amsterdam Smart City. While this doesn’t necessarily imply the priority has shifted from the public benefit to commercial interests, it does warrant attentiveness to the future path of ASC. Glasmeier & Nebiolo (2016) spoke about the magnetic attribute of smart cities, in which cities want to add to their Smart City as many “Smart” approaches as they can, and the further they go along, the more they go astray from their original goals and objectives, as one could observe is the case in Amsterdam. Angelidou (2017) hinted at the lacking process of empowering citizens, and while Amsterdam claims to be a bottom-up fuelled endeavour, the bottom-up component seems rather absent and the view Amsterdam has on bottom-up seems to be more geared towards inclusion and participation, rather than co-ownership and co-creation. What Amsterdam set out to create is close to what Walravens (2015) envisioned as Smart Citizens, but, it is questionable to what extent citizenship is on a higher pedestal than technology in the current Smart City approach ASC has.

This thesis has shown that, yet again, the Smart City concept is largely a container concept, and while this doesn’t necessarily imply it is a bad thing for cities, the concept needs a large re-evaluation to be as effective as many authors would like it to be. Perhaps Hajer & Dassen (2014) were right in their approach stating that we should be transitioning towards “Smart Urbanism”, in which the so-called agents of change are all aligned to create liveable cities, based on their histories, the social composition of cities and the resources required to run and manage a city. It is questionable however
to what extent a new concept, how-well formulated it may be, will bring the change one would hope to achieve, or whether it will result in Smart Cities 2.0.

6.3.2 Implications for Policy
Realistically, the findings of this research paper, while surprising for a city that is seen as one of the Smartest Cities in the world, do not necessarily implicate a need for direct change. Being less “smart” and bottom-up than one claims is, while a loss of face, mostly negative for marketing aspects. The fact that the concept is not internally consistent does not change the outcomes of the various initiatives and does not aid nor hinder the city in achieving goals, albeit the goals achieved in the end could differ from those that have been set initially.

Having stated the above, there are most certainly aspects in which ASC could improve, to strengthen their Smart City concept. First, ASC explicitly states the desire to include citizens and end-users throughout the process and in various initiatives. While to some extent citizens are enabled and activated to participate, Amsterdam could potentially truly claim its place as the world’s most bottom-up city if it were to undergo an evolution from participation to co-creation, and to become a setting in which participation is the minimum, and not the desired level of inclusion for end-users. While this doesn’t imply that regular citizens initiatives and social entrepreneurship are not sufficient, a true game-changing Smart City (or any other label) starts with truly inclusive planning and recognizing that simply having citizens collect data is not nearly bottom-up.

The second point which ASC could address is the discrepancy between the initial goals ASC has set and the fields in which initiatives are active. While it would not be wise to bet on one horse only, and the inclusion of “related” initiatives is beneficial to dealing with the various urban challenges, from a concept-perspective it would be wise to reshape the ASC concept. The criticism of Glasmeier & Nebiolo (2016), which has also been addressed in the implications for academia, is a good example of the legitimacy of a concept diminishing through the “jungle of activities” that is being created. Being clear and direct in their goals and having projects that are connected to this goal is strengthening the legitimacy of Amsterdam Smart City. They can do so by either being more selective in terms of themes and initiatives, to make sure all initiatives contribute to sustainable economic growth through (technological) innovation, or to define a broader base of what is “smart” and thus a welcome addition to Amsterdam Smart City.

6.4 Research boundaries and critical reflection
This section will deal with explaining the shortcomings and limitations of this work and the method used in this thesis, while the second part will deal with the difficulties and choices throughout the process.

6.4.1 Research limitations, boundaries and shortcomings
The intention of this paper is to give a fair indication of the “real” smart city and the role of bottom-up in such a smart city. One of the main shortcomings of this research is that it fails to address the question it set out to initially answer, as there is no conclusive evidence of what bottom-up initiatives add to a Smart City which is known for this component to exist. While the existence of this component appears to be fairly limited in Amsterdam Smart City, this does not explain why, still, Amsterdam is seen as such a successful case for bottom-up approaches, and what factor of these initiatives makes Amsterdam Smart City so successful, as many claim a bottom-up component does. What this research suggests is that the impact of these bottom-up initiatives is rather limited, however, there is no ASC in which there are no bottom-up initiatives, or where there are many, thus the results cannot be compared and only the present case can be studied.
Furthermore, this study fails to incorporate additional viewpoints, or the view of those directly involved in bottom-up initiatives or ASC, and as such, can only provide an outsider view of the state of Amsterdam Smart City. This is the result of the choice in methodology, which will be further elaborated upon in the next subsection. However, looking back at the results and findings, it would have been beneficial to incorporate this “insiders view”, while it was (thus, falsely) disregarded previously. The research could have benefited from target interviews assessing the impact of bottom-up and the perception of bottom-up and its contribution to the ASC concept, while keeping in mind the different views of what bottom-up means.

One could question the outcomes of the research in relation to the methods too, as the subjective nature of this research and whether or not initiatives are “smart” or “bottom-up” could be, while internally consistent, attributed to the authors’ interpretation of each initiative. Furthermore, one cannot draw definite conclusions on Amsterdam Smart City, as it is an ever-evolving concept, which changes as it grows, and the current evaluation is merely a snapshot at a certain point in its existence.

6.4.2 Critical reflection

One big mistake, or rather, a series of events leading to a bigger mistake, have changed the direction of this thesis completely. After a slow start, slowly but surely an understanding of Smart Cities and their impact, perceived image and ways they come to expression in “real” cities, and a path opened to explore the bottom-up context of Amsterdam Smart City. After setting up an initial research method, and preparing this method, two “practice interviews” were arranged. While the interviews themselves went rather well, and the participants were glad to contribute, the results or takeaways from these interviews were not satisfying and didn’t seem to contribute to the end goal. What followed was the decision to either continue arranging interviews or shifting the perspective towards a more in-depth analysis of every initiative included in ASC. Regardless, this decision has been made and this thesis had to be continued carrying the consequences of that decision. It is believed the author has been at fault here, also by trying to solve the issue rather than contacting the supervisors to have a second opinion or another viewpoint. Looking back, this was a rather faulty judgement. It is believed that the addition of several initiatives being able to shine their light on these findings and their perceived role in a bottom-up Smart City would have been a quality impulse into this document. While the findings of this research shouldn’t be disregarded, they’re one side of the story, and fail to address that which was set out to explore.

The above would be the major focal point for this thesis, which, to some extent, feels like a finished product, but one which had more potential than it showed in the end. The decisions made during this process should be considered and evaluated, but it is unnecessary to stop at it there. Again, the author believes the findings of this paper can most certainly contribute to both academic literature as well as the city of Amsterdam and the Amsterdam Smart City concept.

6.5 Suggestions for future research

Like many other studies in the field of Smart Cities, this thesis has answered questions about Smart Cities and the bottom-up component in smart cities, while at the same time new questions have arisen. This section aims to highlight a few of these questions or topics which can lead to a better understanding/develop of Smart Cities.

The first is related to the use of “bottom-up” in smart city literature, but also in related fields. While it is not as excessive as in the case of smart cities, there are many different views on what constitutes as bottom-up and what doesn’t. Many authors that recommended bottom-up as a factor being able to counter some of the faults the current concept of smart cities has according to them, failed to express what they exactly intended with the use of bottom-up. Having bottom-up initiatives, in whatever shape or way, were presented as the one solution. The way we perceive bottom-up is
important in the sense that Amsterdam may be “bottom-up” for some, but the findings of this thesis disagree. Bottom-up initiatives are often seen as agents of change, and it is questionable to what extent the wide variety of initiatives that currently fall under this more general term are contributing to a more participative and inclusive democracy, and to a more open and transparent planning system in which citizenship is promoted. Investigating which aspects of bottom-up initiatives, rather than the mere existence of these initiatives, contribute to these goals could prove to be beneficial in the long run.

Related to these initiatives are the three hypotheses introduced in section 5.3.4. The list of urban challenges could use some tweaking, as both Fernández-Güell et al. (forthcoming) as well as the two trial interviews stated it was confusing and too long, while the analysis of Amsterdam Smart City revealed that “awareness” campaigns or actions are rather prevalent in the concept, but not adequately covered by any of the 29 challenges noted on the list. However, the main point, and perhaps a direction in which the overview of challenges can be shifted, is the difference between urban challenges that can be managed by non-institutional entities and those that are hard, or impossible even, to be addressed by non-institutional entities. This brings up the question which fields or actions can be taken up by (for example) bottom-up initiatives, and which areas or fields will always need to be attended to by a top-down initiative.

A third interesting research strand, which is perhaps contradictory to the assumptions underlying this very research, is the proposition that bottom-up initiatives can influence and change a Smart City, while these very initiatives are neither officially part of (or recognized by) the Smart City, nor “smart” according to the definition of smart set by that Smart City. While this research focussed mainly on initiatives associated with Amsterdam Smart City, it also found various initiatives located in Amsterdam that could be considered truly bottom-up, albeit not smart. Perhaps the existence of a bottom-up component in a city is enough to contribute to a successful smart city, rather than requiring these initiatives to be part of the Smart City concept. It’s a stretch but would be worthwhile investigating since this research has shown that the bottom-up component within Amsterdam Smart City appears to be largely non-existent, which would imply that this component is either 1) overvalued in the success story of Amsterdam Smart City or 2) existing outside of the ASC concept and somehow contributing to the success.
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