The nature of Smart City initiatives: Governance in Smart City Implementation

Exploring the Governance of two leading Smart City Projects in the Netherlands: TRANSFORM Amsterdam and TRIANGULUM Eindhoven

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Preface

This P4 report is written at the Real Estate and Housing department at the Faculty of Architecture of the TU Delft.

This report will give an overview of my research regarding the implementation of smart city initiatives with the focus on the role of governance. The final report will be presented at the 4th of October 2016 and will be presented to my first mentor Tom Daamen, second mentor Ingrid Mulder and external examiner Jan Jacob Trip.

This report will elaborate on the research topic and complementary research questions. Furthermore the choice of topic will be motivated and the relevance of the topic will be mentioned. The aimed planning and execution of this research process will also be stated.

The results of this research will be useful guidance for policy makers and all people involved with (European funded) Smart City initiatives. The conclusions of this research are a guide for new Smart City plans, programs and projects to improve implementation by focusing on the governance aspects. In detail the following will be strived for:

- To give insight in the effect of Governance factors on Smart City implementation activities;
- To improve the process of implementation by steering on success factors and barriers.

Management Summary

Smart Cities are a popular phenomenon in the academic literature, in documentaries, journals and magazines and in practice. In 2014, in Europe the initiative by The European Innovation Partnership 'Smart Cities & Communities' let to 370 submitted commitments for Smart City projects and solutions by more than 3000 partners.

Cities have always been important but will play an even more important part in the future of urbanized Europe. Major challenges that cities are facing are due to changes in the economy, in the related availability of capital, in their demographic profile, in mobility, in the environment, in climate change, in social participation, and in energy shortage, usage and production. In order to face these challenges, many stakeholders place great faith in the concept of the Smart City.

As for government intervention, Smart City development is widely influenced by all different government levels, however, the concept is mainly pushed by the European Union, or on a local level by cities and municipalities. The European Union is promoting the benefits of Smart Cities, saying this leads to "a significant improvement of citizens' quality of life, an increased competitiveness of Europe's industry and innovative Small and Medium Enterprises, together with a strong contribution to sustainability and the EU's 20-20-20 energy and climate targets" (European Commission , 2013). Although many place great faith in Smart City as a concept to face urban challenges, there seems to be a large gap between policy, political ambition and implementation. The increased attention and ambition of Dutch and foreign cities to become 'Smart' in combination with the ineffective strategy to actually implement (and upscale) Smart City projects signal a need for a way to improve Smart City implementation. Understanding 'how' to realize Smart City visions, we need to find ways in overcoming barriers and including success factors in effective Smart City initiative implementation.

My main research objective for this thesis is to provide insight in the critical governance factor influencing Smart City implementation. Investigating on 'how to' implement Smart City initiatives, clarifying the success factors and barriers, collecting evidence-based challenges and solutions towards Smart City implementation in urban development, focusing on the critical role of governance factors in Amsterdam and Eindhoven in the Netherlands.

The Smart City concept

Basically the concept for the Smart City is the representation of integrating the 'business intelligence' possibilities of ICT within the domain of urban area development ('the approach'), to realise ambitions on a higher level than ever – quality of live; sustainability etc. -('the essence'), while at the same time – forced by developments like globalization, liberalisation and climate change - adjusting the classic governance to a more open and participating collaboration process between designers, developers and citizens ('the nature'). This nature of the Smart City is the central research topic for this thesis.

Based on the Smart City framework by Chourabi et. al. (2012), eight sub-factors (sub-processes) which make up the critical factor 'governance' are: Collaboration, leadership and champion, participation and partnership, communication, data-exchange, service and application integration, accountability, and transparency. For each of these sub-factors of governance the main characteristics are derived from the literature. Based on these characteristics for each sub-process a definition is formulated. The relation between these different governance sub-processes is presented in a visual model.

Conclusions with respect to the 8 Governance aspects

‘Collaboration’ is the core sub-process of governance. Most initiatives need to start with people and institutions seeking collaboration to set and realize their objectives. ‘Leadership and champion’ is an essential role within each Smart City initiative. In order to build momentum, generate commitment towards targeted results, and engage stakeholders to ensure sustainability of the programme. ‘Participation’ can be a formal or informal process of citizen commitment, in order to involve and empower stakeholders to reach consensus and acceptance of Smart City solutions. A ‘partnership’ is a coalition among stakeholders who share rights and responsibilities based on agreements in the formalized form of contracts and policies. ‘Communication’ facilitates all governance sub-processes and is crucial for sharing information in various forms and for interaction between all stakeholders. ‘Data exchange’ can strengthen the collaboration, management and governance since it offers a shared base of information to support a more open culture. ‘Service and application integration’ is supposed to unite different systems and functions to enhance the quality of the city. ‘Accountability’ is the process of willingness to accept responsibilities, enforcing collaboration, and facilitating democratic control. ‘Transparency’ is mainly concerned with the decision making processes and thus accountability within the initiative.

The Research Methodology

Case Studies

Transform Amsterdam

Triangulum Eindhoven

Conclusion

Reflection

*(*aanvulling nodig)*

1 Table of Contents

1 Introduction

This chapter introduces the topic of Smart City implementation. After a short explanation of the Smart City concept, I will touch upon the main drivers for this relatively new phenomenon in urban planning and development. I will also investigate the implementation strategies to realize a specific Smart City concept in a specific urban context, provide an overview of different perspectives on the mishaps in Smart City implementation, and motivate the choice for focusing on governance aspects. Next I will describe the scope of this research, followed by the research questions that have guided this study. The focus lies on two cities in The Netherlands – Amsterdam and Eindhoven – where the implementation of different smart city concepts has been pursued. The chapter ends up with a research design and a short reader's guide to outline the structure of this thesis.

1.1 The importance of Smart City Implementation

The last years Smart City initiatives are springing up everywhere. In 2012, there were approximately 143 ongoing or completed self-designated Smart City projects. Among these initiatives, cities in North America (35 projects) and Europe (47 projects) are leading efforts to implement smart technologies to address and resolve urban problems. All demonstrate high expectations of the use of the concept of (becoming) a Smart City (J.-H. Lee & M. Hancock, 2012). In 2014, in Europe the initiative by The European Innovation Partnership 'Smart Cities & Communities' let to 370 submitted commitments for Smart City projects and solutions by more than 3000 partners (European Commission, 2014a). In the lead are the business sector and public authorities, private individuals show to be only 2%, as shown below.

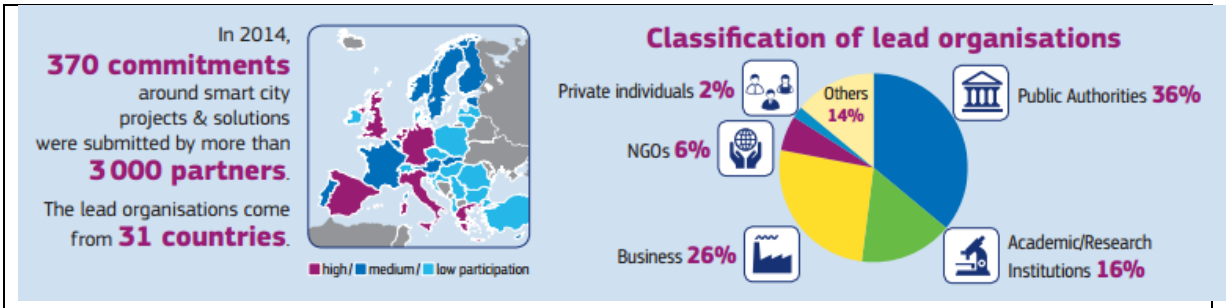


Figure 1.1- XXX Overview SC Europe (European Commission, 2014a)

URENIO (Urban and Regional Innovation Research) published a research which revealed that in the next three years, one-third of medium-sized and large cities will define their Smart City Road Map (Brooks, Claps, Clarke, & Wang, 2015). According to the Amsterdam Smart City (ASC) platform, in Amsterdam already over 90 Smart City projects have been realized together with over 130 partners (Amsterdam Smart City, 2016).

Cities will play an even more important part in the future of urbanized Europe. Major challenges that cities are facing are due to changes in the economy, in the related availability of capital, in their demographic profile, in mobility, in the environment, in climate change, in social participation, and in energy shortage, usage and production. In order to face these challenges, many stakeholders place great faith in the concept of the Smart City In this context, the urban development process has changed by adding ICT as an extra layer, making the implementation process even more complex. This observation calls for appropriate long-range policy strategies for urban areas (Urban Europe,

2011) and new and innovative ways to manage and govern the complexity of urban living problems (Chourabi et al., 2012).

1.2 Smart City as Urban Development

The Smart City is, like any other urban development form, "part of a broad range of activities involving government intervention at various levels, from local, regional or provincial to national or even international level, and in interaction with the activities of private organizations" (Hoek & Wigmans, 2011). In the case of Smart City development, instead of involving private organizations such as property developers, often other organizations are involved: for example ICT companies, energy or grid companies, and consultancy companies. As for government intervention, Smart City development is widely influenced by all different levels, however, Smart City development is mainly pushed by the European Union, Governmental organizations and the sales force of technology companies.

Concerning the five main disciplinary aspects of urban area development (Peek and Franzen, 2007), the following can be posited: Smart City developments need to establish public private partnerships (1) to form a stable basis for collaboration. An example is the European Innovation Partnership (EIP) which "looks to establish strategic partnerships between industry and European cities" (Smart Cities and Communities, 2013). Land assembly (2) is not always relevant for Smart City development, however, specific zoned areas (living labs) are often determined, influencing development to a great extent; as for financial engineering (3) it often shows that assessing future value of an investment is very difficult, since Smart initiatives can be seen as urban innovation programs in which outcomes are still unknown. Thus finding funding is a big deal. Urban design (4) of a Smart City, can deal with spatial outlines for example infrastructural works, here often ICT takes over the spatial aspects of urban development. Finally, branding (5) is a key component for a Smart City in communicating core-values of the future area, and changing its reputation.

Urban development can be described as a linear process, starting with an initiative, followed by planning, execution and maintenance. However in reality, urban development (especially Smart City development) is often an iterative process. As the 'Smart Cities and Communities' puts it in their 10 year rolling agenda

> The transformation towards the Smart City will not be a linear development, but based in many cases on trial and error. Cities therefore will require space to experiment, to learn from their successes and failures and, more generally, to gain experience . . . [therefore] the development of smarter cities requires smarter planning… Good plans are to be followed by good governance of the city, so governance innovation is an intrinsic part of successful planning and implementation (Smart Cities and Communities, 2013).

This articulates the need for governance in the complex network environment of Smart City development.

For urban innovation, Smart City in particular, the external system is of high importance. This system includes: the external environment, government policy and regulation, social network and incentives, and is shaped and impacted by the innovation under consideration. The choice to develop Smart City initiatives in an urban area generally depends on the role of public local government, on the territory and on its capacity to drive and influence the creation of public infrastructure for Smart City implementation (Ojo, Curry, & Zeleti, 2015).

Smart City initiatives and long-term urban planning are still somewhat separate worlds. As Angelidou (2016) states in a recent study on 4 cases of Smart City development:

> Apparently, many cities fail to see smart city programs as part of their long-term, comprehensive development plan and, consequently, they do not engage in methodical strategic planning. However, smart city strategies represent very important urban development policies that include large investments and long-lasting physical infrastructures (Angelidou, 2016, p. 27).

She concludes the same study with an optimistic view on a future enforced relation between long term urban development and short term Smart City initiatives:

> Overall, it seems that we are finally heading towards a true integration of the digital with physical and institutional dimensions of the smart city. Physical planning and social policy, then, can and should underpin the digital or 'smart' dimension of the city and promote its integration upon them (Angelidou, 2016, p. 27).

Urban governance

In the Netherlands, the capacity of the government to change public infrastructure, thus the role of the government in urban development has been shifting: "Nobody has the monopoly over area development any more. The government had to give up its monopoly and enter into all kinds of co-productions" (Hoek & Wigmans, 2011). The more traditional approach of developing cities through government-led town planning has gradually been shifting to the more entrepreneurial approach of strategic management of both public and private initiatives in the urban environment. This method of policy making is increasingly developed on the basis of consultation. Without the partial agreement of private market wishes beforehand, hardly any intrinsic urban development can take place. Private parties are, or need to be, included at an increasingly earlier stage. In the case of Smart City development, the role of the government can be varying from pushing and promoting, to facilitating and stimulating.

Smart City policies in the Netherlands

The first Dutch election for 'Smartest inner city', pushed by the industry, was in 2015. This same year Jorritsma, chair of the Association of Dutch Municipalities, preached that every city or municipality should try to be 'Smart' by implementing technology in cities/city governments to benefit the citizens. For the city of Amsterdam, the Smart City is a key theme in the city. Therefore, Amsterdam has set up 'Amsterdam Smart City', which is a "public-private partnership, including knowledge institutes, that provides a platform for projects to contribute to (mainly) energy goals of Amsterdam. This platform concentrates in three city areas" (Unknown, 2012a). As in Amsterdam, local government of a Smart City often performs as a civic boosters, aiding urban entrepreneurialism, through providing public–private partnerships and knowledge transfer through higher education institutions (Hollands, 2008).

1.3 The Smart City Concept

Europe and the Smart City

The phenomenon of a Smart City is relatively new and has many interpretations. Baccarne, Mechant, & Schuurman (2014) see the Smart City as "a conceptual model which embodies a fresh wave of techno-optimism and emphasizes the positive effects of ICT and other innovative technologies in a

city, often in combination with multidisciplinary collaborative partnerships" (Baccarne, Mechant, & Schuurman, 2014).

In Europe, from 2008-2010, the economic crisis really struck urban development practices. In this period alarming sounds came from property developers due to decreasing demand. At the same time smart urbanization publications appeared, involving new private parties, like ICT and energy companies. This concept grew globally, pushed by private companies like IBM and Cisco, who try to play their part in urban development (Ministerie van Infrastructuur en Milieu, 2014).

> Around the year 2010 an important paradigm-shift has taken place in the mind-set of city managers, policy makers and industry leaders. Cities realized that building sustainable systems needs to includeindustry and technology providers to a far greater extent than originally thought. At the same time, the digital revolution made it actually possible tomaximize efficiency of urban systems by linking clean technologies, infrastructures, city operatorsand citizens through smart devices and intelligent services. Businesses identified cities and urban environments as massive new markets and started to introduce apparently tailor-made solutions for the connected and digital city. Data-driven processes are now improving our urban mobility systems and increasingly decentralized energy flows. They help city authorities to take better decisions, save money and have the potential to connect to their communities on a real-time basis. Taken together, this shift of paradigm is the smart city!(Duncan, 2015)

The European Commission and the European Investment Bank launched a "Smart Cities & Sustainable Development" Program in Europe:

> The Program is aimed to secure the EU's 2020 objectives by developing/redeveloping smart, sustainable and inclusive cities and communities in Europe. It involves the financing through a Framework Loan of large municipal investments around the concept of pan-European "smart cities & sustainable development", and specifically in the domains of sustainable urban regeneration, ICT, renewable energy, energy efficiency, transportation and mobility, to be carried out by local authorities, utilities, smart SMEs, and other founding members of the EIP on Smart Cities and Communities providing services to authorities over the period 2014-2017 for a total investment amount in excess of EUR 10 bn" (bron). They still find this investment relatively modest "considering the smart city market projections to exceed $ 1 trillion by 2016" (bron).

The European Union is promoting the benefits of Smart Cities, saying this leads to "a significant improvement of citizens' quality of life, an increased competitiveness of Europe's industry and innovative Small and Medium Enterprises, together with a strong contribution to sustainability and the EU's 20-20-20 energy and climate targets" (European Commission & Bartholmes, 2013).

Main drivers of the Smart City concept

There are multiple drivers for Smart City implementation. "Smart city projects have mushroomed in the US and Europe in recent years to solve common urban problems… …Technology may be the key factor of smart cities, but there are other factors that drive smart cities that cannot be ignored" (Raj, 2016). According to Wolfram (2012) the main factors contributing to the emerging of the concept Smart City are grand environmental challenges (global warming and climate change), urbanization issues (growing share of urban population), competition (cities are competing against each other, ranking and branding), technology convergence (rapid technology push of ICT companies and system components), industrial convergence (integrating ICT components with other infrastructure and technology) and finally the information society, which becomes more advanced and widespread in

which the role of the internet as enabler of collaboration and city services has become more important for urban development.

Cities and municipalities seem to use the Smart City concept as a form of city-branding, achieving high international rankings, attracting people and businesses, and stimulating economic prosperity.

Smart City strategy

Making a city 'smart' is emerging as a strategy to mitigate the aforementioned urban challenges (Chourabi et al., 2012). The heightened interest by a wide range of stakeholders for the potential of Smart City initiatives as a 'new' approach to the urban area development scene throughout the world, but mainly in Europe, requires for cities to have a suitable urban development strategy. "Smart Cities emerge not just as an innovative modus operandi for future urban living, but as a key strategy to tackle poverty and inequality, unemployment and energy inefficiency" (Dameri & Rosenthal-Sabroux, 2014).

According to (Rodriguez-Bolivar, 2015) the Smart City concept can serve both in defining means and ends of local economic development. Also Staffans & Horelli (2014) sees the concept is still in flux "The smart city seems to be both a strategic way of action and a normative, even a utopian goal, which often comprises a description of the city as a living environment enriched by ubiquitous technology" (Staffans & Horelli, 2014).

In this research I see the Smart City more as a tool in which the focus can be kept on 'how to' achieve goals like sustainability, innovation, employment and a better 'quality of life'. Like Meijer and Bolívar (2015) show in their research about the governance aims of Smart Cities, it is not about better outcome of urban governance (wealth/health/sustainability), but about the better process of urban governance, i.e. citizen participation and forms of collaboration (Meijer & Bolívar, 2015).

According to Hajer & Dassen (2014) the Smart Cities promises to be an era of innovative urban planning, driven by smart urban technologies that will make cities safer, cleaner and, above all, more efficient. However, even though the Smart City strategy may be an appropriate long-range policy strategy for urban areas, many say "not enough progress has been made in implementation" (Smart Cities and Communities, 2013). Therefore I think the Smart City needs a Smart navigation system on Governance, to show cities and actors involved how improve the process of implementation.

1.4 Three perspectives on implementation issues

Cities in Europe are appointing 'living labs' or 'Smart Urban Labs', creating playgrounds in the form of urban districts, for innovative and experimental Smart City projects. New ways of working, collaborating and networking are put into place, to improve the process of implementation. However Smart City implementation is still hampering. What are the issues in the process of Smart City implementation? I will discuss this from academic, industry and governmental perspectives.

Academic perspectives on Smart City implementation

In the academic literature on Smart Cities multiple implementation issues are mentioned.

According to Veeckman and van der Graaf (2014) "The fundamental issues of realizing the Smart City implementation are very hard to define, and vary widely. Detailed analyses on how to manage smart city initiatives as well as descriptions of underlying challenges and barriers, seem still scarce"

(Veeckman & van der Graaf, 2014). For example poorly-managed conflicts during implementation can diminish the potential of smart cities and discourage future improvements (Kim, 2015).

“Generally, the transformations towards Smart Cities faces a set of challenges that vary from one region to another and between countries within the same region” (Ibrahim, El-Zaart, & Adams, 2015). But these also differ between Smart City initiatives. The challenges range from complexity, economic, social to governance and technological challenges.

The following issues and categories are described: Smart concepts are still in their infancy, the complex nature of the city, and restricted investment capabilities (Cosgrave, Arbuthnot, & Tryfonas, 2013). Nam and Pardo (2011a) refer to four categories: technological, policy, management, and context issues (Nam & Pardo, 2011a), while Chourabi et al. (2014) mention eight influencing factors, among which the previously mentioned factors by Nam and Pardo, together with: Peoples and Communities, Built Infrastructure, Economy, Natural Environment and Governance. Almost every source in literature uses a different framework for analysis, however technical and governance aspects show to be a central aspect of most frameworks.

Smart City projects are depending on many technological components. Examples of technological innovation risks are: incompatibility between old and new systems, lack of technological knowledge, and too much hope over technological feasibility. The use of advanced technologies increases complexity and uncertainty. The greater the risk, the more necessary to look beyond technology for effective managerial and policy tools necessary to deal with the risk (Nam & Pardo, 2011b).

A study on the issues in realization of UK Smart City initiatives found that the transformative power of technology was often overestimated and the importance of the ‘soft’ human infrastructures that underpin urban decision-making and governance were underestimated in Smart City implementation. This study found the following constraints: “The conjectural nature of the smart city debate. . .the weakened capacity of urban governments to control their infrastructural destiny and also constraints on the ability of the public and private sectors to innovate” (Buck, 2015 #162). Other evidence points to important challenges including: having to work through technology providers with different priorities; potential knowledge deficits about what is possible and how it might be steered; and limited resources to fund the required infrastructure.

In this light of 'soft’ human infrastructure, a recent study analysing 13 Smart City cases based on the model of Chourabi (2012) found that the key variables and main factors of successful Smart City Projects are citizen engagement along with the critical role of governance (Kogan, 2014).

Rodriguez-Bolivar stressed the lack of citizen participation:

> despite the growing rhetoric, there is in fact little evidence that smart cities are realizing their visions first, and even more so there is a lack of attention to engagement and empowerment of citizens, SMEs and other entities realizing their needs or ambitions, and of how citizens are empowered to participate in urban development and social innovation in general (Rodríguez-Bolívar, 2015).

While Paskaleva (2016) mainly mentions the critical role of governance:

> Governance-related challenges have been identified as key to service co-production [of Smart City initiatives].” Critical factors include citizen participation and effective collaborative processes between stakeholders (Odendaal, 2003; Paskaleva, 2011), leadership (Mooij, 2003; Lam, 2005), private/public partnerships (Giffinger et al., 2007) and governance infrastructures (Johnston and Hanssen 2011), the latter allowing for collaboration, data exchange, service integration and communication (Paskaleva & Cooper, 2016).

Chourabi et al. (2012) underline the important role of "internal and external governance influencing participatory and collaborative decision making." Nam and Pardo (2011b) describe similar governance related implementation issues, among which "poor planning, weak business case, lack of top management support, lack of leadership, lack of professional skills, misalignment between organizational goals and project objectives, vulnerability to policy swings, too much technology-driven enthusiasm, and political hyper-activism" (Nam & Pardo, 2011b). They state:

> On governance level, it shows the innovative nature of Smart City projects, does not align with the culture in the public sector. Public sector innovation could be an oxymoron; risk taking through experimentation is likely to be institutionally blocked in government. Public sector e-services has a legacy of a risk-averse environment where the focus is on the politically charged short-term delivery of goals and results, lacking a long-term strategy of service innovation. (Nam & Pardo, 2011b)

Ojo et al. (2014) find issues regarding stakeholders and partnerships, buy-in and funding, and participation (Ojo, Curry, & Janowski, 2014), while funding issues are underpinned by (Dameri & Rosenthal-Sabroux, 2014). Finally (Ibrahim et al., 2015) names five challenges facing Smart Cities transformation, which are complexity challenges, economic challenges, social challenges, technical challenges and governance challenges. Of which a governance challenge is "The need of coordination and integration between public, private and civil bodies for the purpose of making a city function as an organism in an efficient and effective manner" (Ibrahim et al., 2015, p.570).

Thus, according to academics, issues in Smart City implementation mainly relate to non-technical aspects. Fundamental issues are concerned with governance aspects.

Industry perspectives on Smart City implementation

Several companies from the urban development industry have also published their perspective on Smart City implementation. According to the industry, challenges in implementing the smart city concept are complex and multiple.

In Research from Forrester, Industry companies like Cisco and IBM, point out in 'Helping CIOs Understand "Smart City" Initiatives', that **"**A critical component of delivering on the smart city vision is management — particularly governance. Many of the obstacles result from a lack of governance that ensures city officials, CIOs, and technology integrators collaborate through a project's entirety — not just at design and implementation, but post-implementation as well." (Washburn et al., 2010 #163).Other issues they found are lack of funding, lack of IT skills, dealing with compliance standards and security and risk management.

Managing and governance issues are related with human capital: having the right people with the right knowledge and skills at the right place and the lack of citizen engagement. Issues regarding open data concern pooling and processing. On top of that, providing assurance in the protection of privacy is another big deal. Some projects carry too many unknowns to roll out immediately at scale and often resources are not available. This relates to cities having shortage of financial capital. Additionally, it is difficult to create transparent investment metrics, due to difficulties in measuring results and ensuring actual sustainability. Furthermore issues regarding complex procurement legislation of product and services make it unable to cope with the use of new ICT services. All of the above obstruct Smart City implementation leading to disappointing results, and prevent pilot projects from being scaled up to city wide projects (Arup, 2013; ARUP, Cosgrave, Doody, & Walt, 2014; Copeland, 2014).

Government perspectives on Smart City implementation

The European Union formulated a broad list of challenges in relation to their 'Smart Cities and communities' platform, mainly focusing on sustainable socio-economic issues. According to the EU "When it comes to devising and implementing a Smart City strategy, it is the complexity of the city itself and of the institutional (decision-making) processes that need to be put in motion to change the status quo" (European Commission, 2013b). Other factors hindering the adoption of Smart City solutions are: "Uncertainties around scaling of newer technologies, technology is not well-understood across city sectors, and existing governance, financing and procurement models are ill-suited for technology integration" (Smart Cities and Communities, 2013).

In publications by public authorities, like Simon Haston, Planning & Strategy of The City of Edinburgh Council, the following issues in Smart City implementation can be found: Political priorities change in time, during the life of a Smart City initiative, resulting in complex decision making and changing commitment. The Business strategy of an initiative is not clearly articulated, relating to a mismatch in governmental culture and business model. On top of this technology is overpromising, and the actual value of Smart City projects is difficult to measure, making plans unrealistic or unaffordable. Finally project teams are missing required capabilities, resulting in strategies gathering dust on the shelf (Haston, 2009).

In a survey by Cisco based on 668 respondents of North American municipal executives, financial issues, like attracting funding, and lack of insights in costs and benefits are the most fundamental issues in Smart City implementation. Other issues are regarding internal organizational challenges, such as the lack of cross-departmental coordination and alignment on priorities, and lack of visionary leadership, and missing citizen engagement (Cisco, 2014).

In the SmartImpact Baseline Report "Local Impacts from Smart City Planning", coordinated by Marc Duncan from the Manchester City Council, published in the URBACT III programma (running from 2014 – 2020) funded by the European Union, is stated that **"the key challenge in creating smart districts is to align four core levels of district development in innovative project consortia"** (Duncan, 2015) These are 1) the technology and infrastructure level 2) the socio-economic strategy level 3) the governance and management level and 4) the availability of finance. Furthermore is stated that **" Developing smart cities in fact means that local governments and city administrations need to become innovators, just like companies need to discover their corporate share in urban governance**"(Duncan, 2015). This publication gives an overview of the main challenges for developing, implementing and operating smart districts and smart cities, structured in three larger categories: 1) **challenges through market barriers;** untested innovative technologies, unclear cash-flow models, failing business models, lack of standards and interoperability of systems 2) **organizational challenges**; companies think in product instead of holistic solutions, and there is a vacuum when it comes to designing, coordinating and leading integrated smart city projects, cities think and act in silos, and 3) **leadership challenges**; missing political leadership, having no real partnerships, needing support in creating sustainable value.

Finally a recent report by the United Nations Commission on Science and Technology for Development, published in January 2016, 'Issues paper on Smart Cities and Infrastructure', in which five main challenges are encountered in the implementation of smart infrastructure projects: these issues are related to localization of smart infrastructure, skill gaps, lack of finance, application of a suitable governance model and inclusivity (UNCTAD secretariat, 2016). **Summary on Smart City implementation issues**

	Government	**Industry**	**Academic**

Policy	• Political priorities change • Complex decision making • Changing commitment • Mismatch governmental culture and business model	• Complex procurement	• Innovative nature does not align with culture public sector; risk averse
Uncertainties/ complexity (mainly financial)	• Business strategy not clearly articulated • Financial issues; lack of funding • Lack of insights in costs and benefits (most fundamental) • Actual value is difficult to measure • Plans unrealistic and unaffordable	• Too many project unknowns (difficult to create investment metrics, measuring results, and ensuring sustainability) • No (financial) resources available	• Projects still in its infancy • Complex nature of the city • Multiple unknowns dealing with future; unknown long term implications; actual value unclear • Restricted investment capabilities/difficult to support investment decisions, funding and buy-in • Limited resources to fund the required infrastructure.
Technology	• Technology is over promising		• Incompatibility old and new ICT systems • High hope technological feasibility • Advanced tech increases complexity/uncertainty/High risk • No clear connection to social agenda having to work through technology • providers with different priorities
Governance/ Management	• Internal organizational challenges (cross-departmental and alignment, lack of leadership, citizen engagement) • Project teams missing required capabilities	• Citizen engagement • Open data (pooling, processing, privacy) • Missing right people, knowledge, skills, place	• Citizen participation • Effective collaborative processes between stakeholders/PPP • Leadership • Governance infrastructure (collaboration, data exchange, service integration and communication) • knowledge deficits about what is possible and how it might be steered

Table 1.1 Overview of Smart City implementation issues, from three perspectives

Comparing the results of academic, industry and government analyses of Smart City implementation issues, shows that there is a lot of overlap on the different issues hampering Smart City implementation.

The main difference comes from the industry perspective (who seem keen on implementing the Smart technology), stating that the technology itself is not the issue. In contrast, academics and

government actors do include new technologies as a barrier to implementation. The research done by Cisco in which municipal executives spread their light on government issues rather than on technology issues, might be due to Cisco's advantage in pushing IT solutions, thus presenting research results in favour of technology applications.

The different perspectives are related to what the different parties have to win from the Smart City. The industry is mainly interested because of the possible revenue and profit on their products and services, the government has a reputation to win or consolidate for future elections and the academic researchers have possibilities for funded research with broad interest. It is clear that the different visions on the smart cities are influenced by the interests of each group.

All in all, implementation issues are related to uncertainties (financial and technological) and governance aspects (policy, management, and governance). An underlying issue is the complexity of cities [multiple parties, stakeholders, and processes], which remains the most significant barrier to adopting Smart City solutions (Falconer & Mitchell, 2012).This complexity is not a barrier which can be overcome easily. Although each Smart City initiative will have its own critical bottlenecks, it is clear governance aspects are of great influence and critical importance for the success of a Smart City.

1.5 Problem Statement and Aim of the Research

Problem statement
By now, it is clear that although many place great faith in Smart City as a concept to face urban challenges, there seems to be a large gap between policy and implementation. As Buck states, it is a "challenge for policy-makers of moving from attractive but elusive imaginaries of smart city discourse to tangible intervention" (Buck 2015:162).

The ambition of Dutch and foreign cities to become 'Smart' and their inability to actually implement Smart City projects, signals a need to improve Smart City implementation. Understanding 'how to' realize Smart City ambitions means being able to recognize and overcome institutional barriers, and identify governance principles for effective smart city implementation. If not, as Ching (2013) points out that the "inadequate understanding of smart city implementation may lead to cities falling for possible image or technological traps, heavy investments in ICTs and infrastructure without maximizing their potential" (Ching, 2013).

Apparently there are common problems as well as specific issues when a Smart City concept is carried forward towards implementation. However, there still seems to be limited insight on how to overcome the barriers that hamper smart city project implementation. What steps are part of an effective governance strategy for smart city implementation? As Mora states "only a few examples of procedures can be found in scientific publications. However, they come mainly from the grey literature produced by the corporate sector and are characterized by both a low level of detail and a lack of empirical evidence" (Mora 2015: 164).

> Due to a lack of experience with the development of smart districts and a corresponding scientific monitoring of processes, there is **no comprehensive overview over the barriers and risks** that are related to the development and implementation of smart districts and there is no toolkit or basket of risk-reduction strategies and instruments that would help stakeholders identify the right strategies and measures to provide for good

organizational, financial and technology-oriented measures to overcome the barriers and counter the risks."(Duncan, 2015)

Research Objective: shaping strategies for smart city implementation
I will focus in this thesis on how to achieve the effective implementation of Smart City initiatives. I want to investigate how to improve smart city implementation, particularly with regard to the governance factor. Hence, the main research objective is to provide insight in the governance behind Smart City implementation efforts by identifying the issues and tensions as well as the challenges and solutions found in the literature about Smart City implementation and in projects in Amsterdam and Eindhoven, The Netherlands.

1.6 Research Scope

On a strategic level, Angelidou (2014b) reviewed the factors that differentiate policies for the development of Smart Cities. He identified four strategic choices with a spatial reference: national versus local strategies, strategies for new versus existing cities, hard versus soft infrastructure-oriented strategies, and sector-based versus geographically-based strategies (Angelidou, 2014). In this research I will focus on initiatives for local, existing cities, and sector-based Smart City strategies.

The choice for Europe is evident, since this continent is strongly promoting Smart Cities through European funding. Therefore the highest number of Smart City projects is hitherto initiated in Europe.. Since most Smart City initiatives in Europe are about redeveloping brownfield areas, this is also the empirical focus in this thesis.

The empirical part of this study is concerned with European funded Smart City projects in the Netherlands. Thus focusing on urban development and the conditional environment in the Netherlands. This implies the use of triple/multiple-helix collaboration, involving public, private, research, other organizations and even citizens. These urban development projects are mostly (planned to be) implemented on scale of a city-district and to be tested in Smart Urban Labs (SULs).

Practicalities aside, the choice for The Netherlands is made because this is a country in which "all major cities have formulated [Smart City] visions and missions, and basically every municipality has their entire governmental organization involved: from alderman to management and contractor. It's not just the enthusiastic project managers any more" (Jansen, 2015). According to Gielijn Blom, a Smart City specialist at Platform 31 (a Dutch knowledge and network organisation) contacted for this thesis, the most relevant cities to focus on are Den Haag, Delft, Amsterdam and Eindhoven. In fact, Amsterdam and Eindhoven seem to be European frontrunners in Smart City development. Jansen (2015) even claims that "Amsterdam and Eindhoven are two of the few heralds of Smart City development" in the world**.** This claim is underpinned by multiple case studies focusing on Amsterdam as a Smart City, and the outcome of a recent survey of worldwide Smart Cities by IESE Business School in Spain who examined 135 cities worldwide , which placed both Amsterdam(16) and Eindhoven (15) in its top 20. Both cities scored well on Urban Planning, and Governance. A year earlier, Amsterdam was ranked 2nd Smartest City in Europe by Boyd CohenThe two projects focused on in this research are TRANSFORM (Amsterdam) and TRIANGULUM (Eindhoven).

Transform Amsterdam:

Transform was a European funded Smart City programme executed between January 2012 and August 2015. Transform was a European collaboration of six European cities including Amsterdam, Copenhagen, Genoa, Hamburg, Vienna and Lyon and thirteen partners working

together to improve their policy and programs to lower carbon dioxide emissions: making a TRANSFORMation agenda for low carbon cities. The project dealt with the energy transition of cities under the umbrella of Smart Cities and Communities. The overall budget of Transform was 10 million Euros (TRANSFORM, 2015).

TRIANGULUM Eindhoven:

The three point project Triangulum is one of the three European Smart Cities and Communities Lighthouse Projects, set to *demonstrate, disseminate* and *replicate* solutions and frameworks for Europe's future Smart Cities. The flagship cities Manchester (UK), Eindhoven (NL) and Stavanger (NO) will serve as a test bed for innovative projects focusing on sustainable mobility, energy, ICT and business opportunities. The project consortium combines interdisciplinary experience and expertise of 22 partners from industry, research and municipalities who share the same objective and commitment to develop and implement smart solutions in order to replicate them in the three follower cities Leipzig (D), Prague (CZ) and Sabadell (ESP). The overall budget of Triangulum is 30 million Euros (2015-2020). The European Commission funding (Horizon 2020) accounts for 25 million Euros. The project duration is from February 2015 to January 2020.

In this research I intend not to come up with a comprehensive definition for Smart City development, neither will I focus on the often mentioned ranking of Smart Cities. I will see the Smart City concept as a means to an end, rather than an end in itself. I will not evaluate the actual outcomes of the Smart City (projects) since the focus lies on the governance process. I will also not include empirical analyses of Smart City initiatives in other parts of the world, or provide an overall list of general 'success factors' as seen in other studies (Nam & Pardo, 2011; Chourabi, 2012; Kogan, 2014). I strive to provide an overview of the specific governance sub-factors and the related barriers and success factors in Smart City implementation in European funded initiatives in The Netherlands: Triangulum and Transform

1.7 Research Questions

The problem and scope described above brings us to define the following research questions, divided into a main, action-oriented, question and several knowledge questions about Smart City implementation and initiatives in The Netherlands:

Main question: How are Smart City initiatives governed in Amsterdam and Eindhoven and how can governance factors improve implementation?

Sub questions

1. Which factors influence Smart City implementation?
    a. What is a Smart City?
    b. Which factors determine the Smart City implementation?
    c. Which factors are most important for successful implementation?
2. How can governance factors contribute to effective implementation of Smart City initiatives?
    a. What is governance?
    b. Which governance factors influence urban development implementation?
    c. Which governance sub-factors influence Smart City implementation initiatives?
    d. What is the relation between the governance sub-factors and their impact on implementations?

3. What governance sub-factors have been used to stimulate the implementation of European funded Smart City initiatives in Amsterdam?
4. What governance sub-factors have been used to stimulate the implementation of European funded Smart City initiatives in Eindhoven?
5. How can governance sub-factors improve Smart City implementation in Amsterdam and Eindhoven?

1.8 Conceptual model

In the research questions different concepts are involved. The domain of study is urban development. The focus is on the Smart City concept and the implementation of this concept in practical initiatives with typical Smart City objectives. The results of an implementation are significantly influenced by the governance of such initiatives. The governance can be seen as a collection of sub processes to create and maintain the necessary implementation power to realize the Smart City objectives. The execution of governance is depending on numerous decisions made by the collective stakeholders. In this situation 'governance' is the independent variable and the 'Smart City implementation' the depending variable.

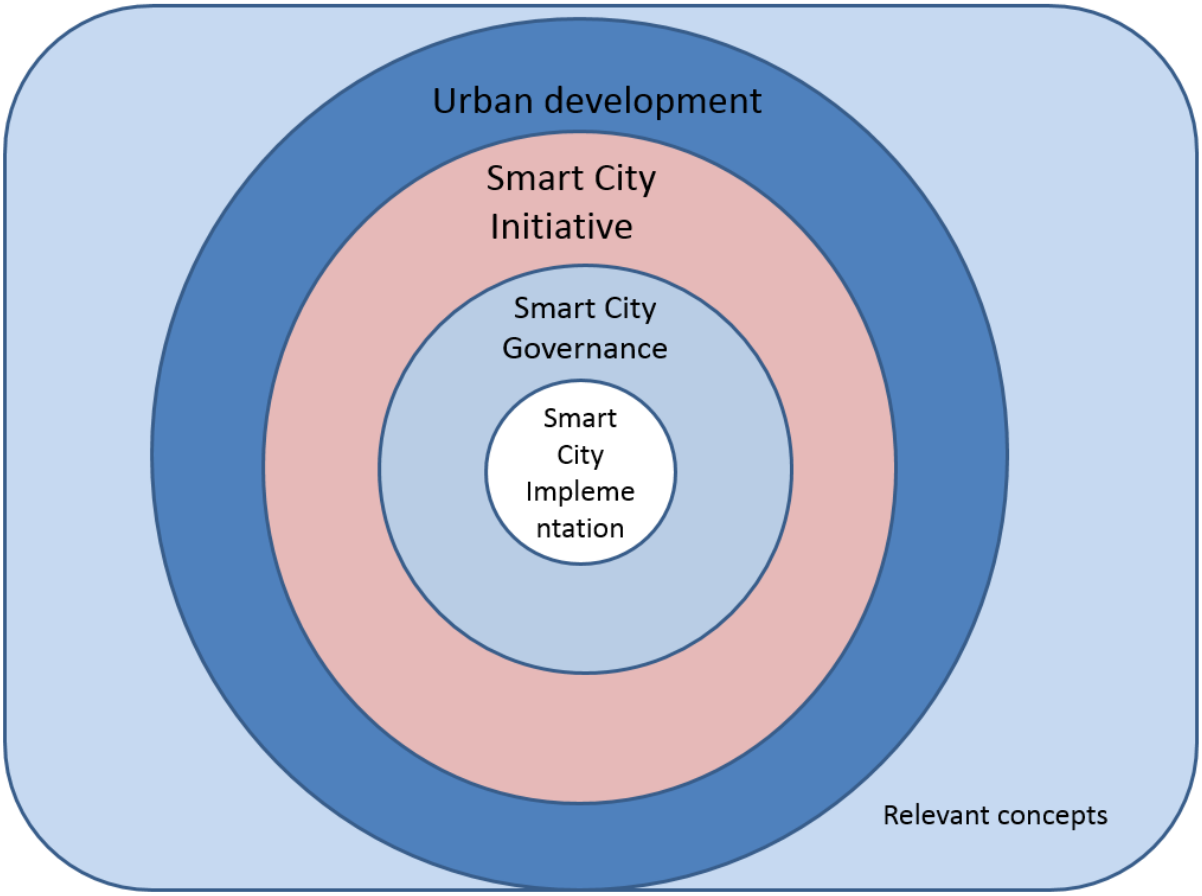


Fig. 1.2 conceptual model

For these core elements of the domain of study for this thesis I present a definition based on literature or on own insight developed during this study.

Urban development: "Collective action, both in formal government arenas and in informal mobilization efforts, which seeks to influence the socio-spatial relations of an urban area, for various purposes and in pursuit of various values"(Healey, 2006).

Smart City concept: A city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership' (EU working definition)

Smart City initiative: Agreed action between different stakeholders to realize one or more specific Smart City objectives. The action can have the form of activities, one or more projects or a complete program. (N.Hartemink, 2016)

Smart City Governance: The collective governing in Smart City initiatives based on complex networks of stakeholders without hierarchical structure and line of command and control, meaning to bundle activities of all relevant parties and create an optimal environment to realize agreed upon objectives. (N.Hartemink 2016)

Smart City implementation: Projects, programs and activities launched by a group of stakeholders to realize one or more aspects of a Smart City concept in an urban environment. (N.Hartemink, 2016) The 'implementation power' is strongly influenced by the governance sub-processes.

1.9 Research Design

Literature/Desk research on

- the Smart City concept
- the implementation issues
- the governance aspects
- success factors and barriers

Key words used: Smart City, Smart City concept, Smart city framework, (Amsterdam Smart City)

Governance

Main data bases:

Since Smart City is a topic of global interest for many sciences: names of different journals

Case study:

- Analysis of documentation
- Interviews with stakeholders concerning the governance factor
- Analysis of statements concerning Governance sub-factors
- Relating statements to Governance sub-factors
- Defining recommendations based on the literature

*(*Update aanpassingen)*

1.10 Research Relevance

Scientific relevance

Different researchers have already signalized that there is a high demand for better understanding of the role of governance aspects during the implementation of Smart City initiatives, based on the analysis and comparison of practical cases.

"it could be interesting to analyse some empirical experiences in smart cities regarding the role that governments are taking in each one of them as well as the success of these smart initiatives. It could help us to understand factors or drivers for governance models in smart cities" (Bolívar, 2015).

Kitchin (2014) calls for empirical in-depth case studies of specific Smart City initiatives and comparative research that contrasts Smart City developments in different locales, which is substantiated by Lee et al. (2012). A very recent international call for papers on Smart City Governance comes from Inderscience, in which Paskaleva (2016) encourages authors to consider "co-production of services in the smart city in the context of both our theoretical understanding and our practical experience of how such governance works." (Paskaleva, 2016) This research is an answer to these calls.

Societal relevance

Smart Cities Stakeholder Platform's Roadmap Group acknowledged in 2013 that "Interest in Smart Cities has triggered plenty of theoretical and technology-led discussions, but not enough progress has been made in implementation." (bron). More than two-third of Smart City projects remain in the planning or pilot testing phases. "Neither soundly tested business cases nor comprehensive hard evidence of impacts of these projects is widely available" (European Union, 2014). Even though implementation is hampering, the number of Smart City initiatives, plans, projects, publications and websites on the topic 'Smart Cities' is considerable and daily growing. The European Union, in particular, is investing in Smart City strategies for metropolitan city regions such as Barcelona, Amsterdam, Berlin and Manchester. Even before the year 2014, a staggering 240 European cities (EU-28) have launched a Smart City Strategy (Mora, 2015 #165). Today, many Smart City events are being organized, like the EXPO in Barcelona, or the ones I have attended in Delft, Schiedam, The Hague and Amsterdam. During these events speakers are stressing the importance of Smart City governance, without really knowing what exactly governance is, let alone 'how' this can be improved.

1.11 Readers guide

In chapter 2 I present an overview of the Smart City with the focus on the origin and objectives, the strategies for implementation and the different influencing factors. Chapter 3 gives insight on the term governance and the role in urban development and Smart City implementation. The constituting sub-factors are described in chapter 4, the core of this thesis. Chapter 5 describes the research methodology used to analyse the cases. Chapter 6 introduces the cases, chapters 7 and 8 describe initiatives in Amsterdam and Eindhoven with special attention to the governance aspects. The conclusions of this research is presented in chapter 9 followed by recommendations to improve governance for both cities. The next figure gives an overview of the structure of the thesis.

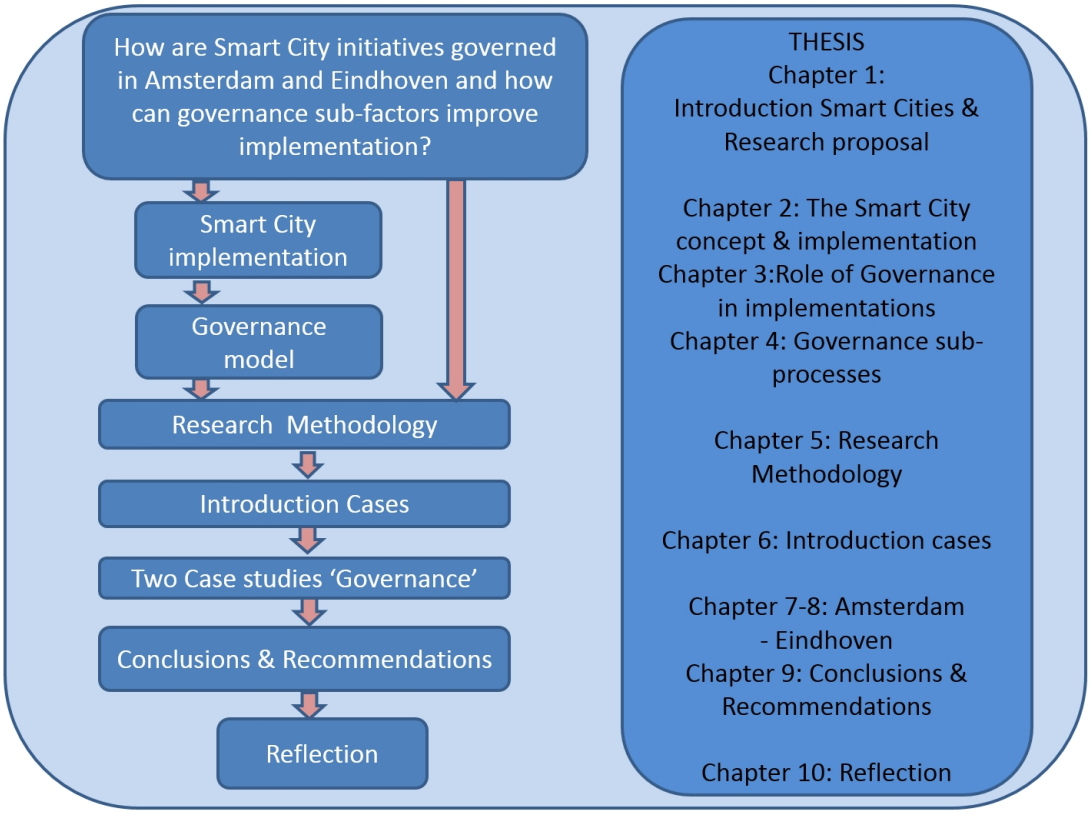


Figure 1.3 Research steps and structure of the thesis.

2 The Smart City Concept

Research Question: Which factors influence effective Smart City implementation?

This chapter will give insight in the main concerns for Smart city implementation. I will discuss the origin, concept and objectives of Smart City initiatives as background for an analysis of success factors and barriers during implementations. The inventory of influencing factors will make clear that 'governance' is a critical factor for further investigation.

2.1 Conditions for the Rise of the Smart City

The concept 'Smart city' had a boom in 2009 after the EU strongly committed to support and fund 'smart initiatives' in European cities, aiming to reduce CO2 emissions and to govern energy consumption, waste treatment and building efficiency. Which factors made the concept of Smart City to arise?

A lot of Smart City projects and initiatives have popped up as a seeming answer to some societal challenges that cities are facing. Especially in countries in the European Union the 'smart cities' agenda has gained major attention (Komninos, 2002; Paskaleva, 2009).

According to Veeckman (2014) these challenges offer opportunities for ICT based solutions:… environmental protection, energy consumption, ageing populations, are demanding new and innovative ways to manage the complexity of urban living. These and other challenges, like rapid technological evolutions, force cities to seek solutions and invest in the necessary information and Communication Technologies (ICT) infrastructure and human and social capital development (Veeckman & van der Graaf, 2014).

Fig, 2.1 Smart City projects (Mora, 2015 #164)

According to Wolfram (2012), the main factors driving the Smart City concept forward are grand environmental challenges, urbanisation, technology convergence, industrial convergence and the information of society. Wolfram is convinced that the combination of all these factors gave the punch to this new concept, :

> While actually none of these factors is entirely new or can be convincingly claimed to have triggered 'Smart City' thinking alone, together they have created a dynamic context within which this discourse has been able to unfold through continued reproduction across levels and sectors (Wolfram, 2012).

Baccarne et al. (2014) add other stimulating factors: cities becoming central actors for social, economic and political change, pressure to innovate (open innovation, increased competition,

innovation spiral, etc.), policy support (the importance of funding and governmental support), and city marketing -using 'Smart' as an appealing attribute for the city as a brand (Baccarne et al., 2014).

Veeckman identifies the EU as an important promotor of the Smart City concept:

> It is mainly in Europe, and only recently, that the concept of smartness has become extremely popular, especially after the expression ´Smart City´ became part of the complex mechanisms of EU research funding. The EU funding programs such as [FP7] and Horizon 2020 are an important driver to promote and support the development of smart cities throughout Europe. (Veeckman & van der Graaf, 2014).

Also outside Europe this topic is booming business. In India, the nation is embarking an ambitious $90 billion two-phase industrial programme to build new industrial cities as smart, sustainable cities of the future, in collaboration with Japan (European Union, 2014). China too is pursuing a Smart Cities strategy as part of its efforts to stimulate economic development and eradicate poverty. As of March 2012, this strategy, based in transforming existing cities, involved at least 54 Smart City projects totalling EUR 113 billion (European Union, 2014). Other emergent countries are developing Smart Cities from the ground up, some countries, such as Armenia and Singapore, are now even branding their whole country as a 'Smart Country'.

An overview of global investments in Smart City development makes clear that this is a serious market, both for enterprises and politicians. Frost & Sullivan research estimates a combined market potential of $1.5 trillion globally for the smart city market in segments of energy, transportation, healthcare, building, infrastructure, and governance. The European Union itself has embarked on a long-term strategy for a smart and sustainable growth. In 2014 an overview is made of 468 cities with smart city initiatives in EU (European Union, 2014). The above shows 'Smart City' marketing and development is serious business.

2.2 Characteristics of the Smart City concept

The concept of 'Smart City' is notoriously fluid, scarcely formalized and, to some degree, subject to different ideological interpretations (e.g. Hollands, 2008; Deakin and Al Waer, 2011; Caragliu et al., 2001). However, elements like data, information and communication technologies and urban governance are almost ubiquitous in discussions about Smart Cities (Caragliu, Del Bo, & Nijkamp, 2011).

The origin of the concept of Smart Cities can be traced back to at least the Smart Growth Movement of the late 1970s. Harrison and Donnelly (2011) note the term 'Smart City' has been used by global technology firms, particularly since 2005(Harrison & Donnelly, 2011).

As a means to enhance the quality of life for citizens, the Smart City concept, has been gaining increased importance in the agendas of policy makers, urban planners and ICT companies. However, a shared definition of the Smart City is not available and it is hard to identify common global trends (Neirotti, De Marco, Cagliano, Mangano, & Scorrano, 2014). Most cited definitions for a Smart City include a 'citizen focus' with 'self-decisive, independent and aware citizens'. Caragliu et al. (2011) derive a Smart City definition from the research literature:

> These works generally define a smart city as being 'smart' when investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic development and a high quality of life, with a wise management of

natural resources, through participatory governance (Caragliu et al., 2011; J.-H. Lee & M. G. Hancock, 2012).

These phrases show the high ambition of the concept. Building on these different definitions Ojo et al. (2014) researched literature for the defining elements of Smart Cities and found the following for their *nature*, *essence* and *approach*:

No	Description	Reference
Nature	*Is a* (1) forward-looking City in the areas of economy, people, governance, mobility, environment and lifestyle; (2) form of urban innovation; and (3) Intellectual Capital Profile of a City	Giffinger et al. 2007), (Nam, Taewoo; Pardo, 2011), (Zygiaris, 2012)
Essence	*Means to* (1) Information access, bridging digital divide, lifelong learning, social inclusion and economic development; sustainable economic growth and urban development, higher quality of life; and wise management of natural resources; (2) innovative socio-technical and socio-economic growth of a city	(Hollands, 2008) , (Vasseur & Dunkels, 2010), (Zygiaris, 2012)
Approach	*Involves* (1) investments in human and social capital; (2) investment in traditional (transport) & modern (ICT) communication infrastructure; (3) promoting participatory governance and engagement of citizens; (4) technological, organizational and policy innovation	(Caragliu et al., 2009), (Nam, Taewoo; Pardo, 2011)

Table 2.1 Defining elements of a 'Smart City' (Ojo et al., 2014).

In 'Mapping Smart Cities in the EU'(2014) the working definition of a Smart City is "a city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership" (European Union, 2014).

According to Lee and Hancock (2012) Smart Cities are defined by their objectives:

> A smart city aims to resolve various urban problems (public service unavailability or shortages, traffic, over-development, pressure on land, environmental or sanitation shortcomings and other forms of inequality) through ICT-based technology connected up as an urban infrastructure. The ultimate goal is to revitalize some of the city's structural (environmental and social) imbalances through the efficient redirection of information. Smart cities are envision as creating a better, more sustainable city, in which people's quality of life is higher, their environment more liveable and their economic prospects stronger (J.-H. Lee & M. G. Hancock, 2012).

Meijer (2015) recently published an extensive review of literature research focusing on the definitions of the Smart City concept and the governance in the smart city. He confirms that there are different views and that in about one-third of the relevant publications there is no attempt to give a definition of the Smart City concept. He concludes that there are three different types of ideal-typical definitions: smart cities as cities 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). Based on this insights he presents an attempt to define the smartness of a city incorporating all three perspectives: "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" (Meijer 2015). This type of definition puts the focus on 'smart' as an end, an objective by itself, therefore smart city initiatives where 'being smart' is seen as a mean for reaching other objectives don't fit well under this definition.

Dameri (2013) develops a comprehensive definition for the Smart City:

> 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 wellbeing, 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 (Dameri, 2013)

This variant stresses the fact that a smart city initiative is inseparably detached to geographical area development and that governance influencing rules and policy is an essential factor.

> Smart or digital projects have been influenced from technological innovation and its application to urban areas and themes. It means that the idea of a Smart or a Digital City has been mainly technology drive, instead of policy driven. However, after several different technological applications have been implemented in cities, and each of them has been qualified as smart, to express a unique, universal Smart City definition has become very difficult. The origin of smart implementations explains therefore why a shared definition of Smart City still lacks (Dameri & Rosenthal-Sabroux, 2014).

Towards a Smart City working definition

Rephrasing all these slightly different approaches makes clear that basically the concept for Smart City is the representation of integrating the 'business intelligence' possibilities of ICT within the domain of urban area development ('the approach'), to realise ambitions on a higher level than ever – quality of live; sustainability etc. -('the essence'), while at the same time – forced by developments like globalization, liberalisation and climate change - *adjusting the classic governance to a more open and participating cooperation between designers, developers and citizens ('the nature')*. This nature of the Smart City is the central research topic of this thesis.

Therefore I will use the compact working definition for 'Smart City' of the EU : "A city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership" Although the term 'governance' is not used in this definition it is implicitly referred to as it is a governance process that will make 'a multi-stakeholder municipally based partnership' work in practice.

Visualizing this definition puts the focus on the core elements of Smart City implementation: ICT is always there as an enabler; Urban services and infrastructure are developed not only for their own stake but to contribute to the realisation of high level objectives. To smooth this development process 'participative governance' is a strongly needed success factor (see image below).

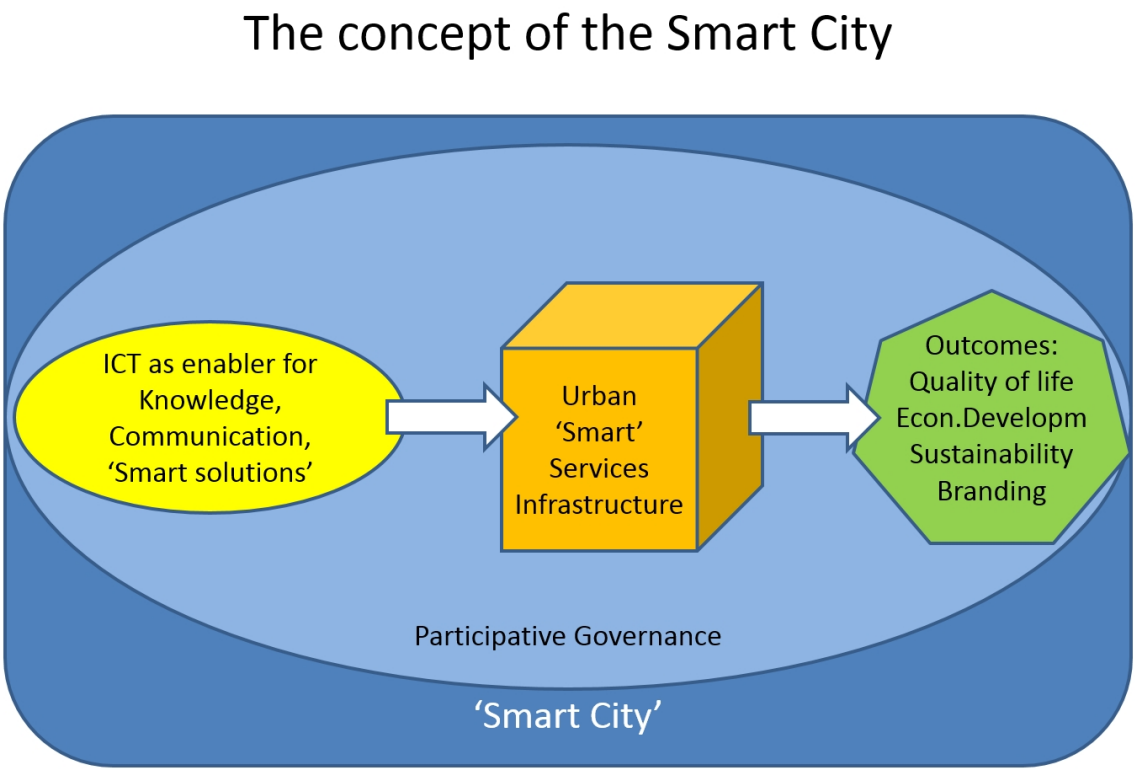


Fig 2.2 Visualisation of the EU working definition on Smart Cities (own ill.)

2.3 Defining Goals

The concept of the Smart City arose among others as a possible answer to the challenges of improving urban life and the natural environment. What are the main objectives to realize by a Smart City concept?

The EU, as a stimulating force in adopting the Smart City concept, has a clear focus on using the concept as a mean to stimulate innovation in the urban area with the focus on 'increased competitiveness', 'enforcing sustainability' and realizing 'energy and climate objectives'.

Smart City initiatives may target a single domain, however in general initiatives would be expected to target two or more related domains. The table below shows cities worldwide are targeting more related domains, with an average of 3,7. Furthermore it shows energy, environment and mobility are the domains most commonly targeted. Ojo (2014) observed, across ten cases, that Smart City initiatives in general aim at:

(1) Carbon reduction and neutrality; (2) achieving energy efficiency; (3) leveraging ICT to develop niche industries such as those relating to multimedia or knowledge-based industry; (4) attaining the highest quality living environment for residents; (5) developing green areas within the city; (6) developing state-of-the-art information infrastructure accessible to all; (7) achieving economic growth and quality of life simultaneously; (8) developing sustainable communities; (9) ensuring social harmony among different groups of residents; and (10) evolving city as living laboratory to foster

continued improvements (Ojo et al., 2014).This shows a high focus on soft domains of living economy and people.

Program	Economy	Economy and Environment	Energy	Energy and Environment	Environment	Environment and People	Environment, Energy	Governance	Lifestyle	Lifestyle, Environment	Mobility	Mobility and Environment	Mobility, Governance, Environment	Technology	People
AMSTERDAM			■								■				
MALMO		■	■		■			■	■		■				■
MALTA	■														
MASDA CITY			■		■			■			■				
PLAN IT							■	■			■				
SINGAPORE			■		■			■	■		■				
CURITIBA		■			■	■					■		■		
SONGDO				■	■						■			■	
TIANJIN					■				■	■		■			
YOKOHAMA			■		■										

Table 2.2 Dimensions covered in ten Smart City Programs (Ojo et.al., 2014)

Some research points out that over time more attention is being paid to the more abstract goal of enforcing the city innovation capability's, thus creating a structural force for the successful implementation of initiatives with specific objectives in other domains.

In the document 'Mapping Smart Cities in the EU', is stated that Smart City initiatives can be considered a useful vehicle for cities to achieve their Europe 2020 targets. Some potential uses and characteristics of Smart City initiatives are:

- Smart Environment or Smart mobility – focus on energy targets
- Smart Economy and Smart People – focus on employment and education
- Smart Governance and Smart Living – focus on poverty and social exclusion

Furthermore "Smart City initiatives are viewed both as instrumental means of tackling specific problems and as a way to build a community of interest or overarching awareness of the potential of such joint initiatives to provide a platform for continued progress that adapts to changing circumstances" (European Union, 2014).

3 Smart City implementation strategies

As there are many differences in local circumstances and objectives for Smart City initiatives, there are also many approaches towards the implementation. The differences in approach is often seen as a difference in strategy. The implementation strategy or 'approach' is the planned road to realize the objectives ('the essence') working under the governance influence of collaborating stakeholders ('the nature'). The strategy is developed by the stakeholders in their collaboration and thus influenced by the collective governance. Strategic choices in return have their impact on the way governance sub-processes can be designed and executed. For example in a top-down strategy the participation level will be low to zero.

In most UAD and Smart City initiatives the implementation process is sub-divided in four phases. Actors take the initiative to set goals, define a strategy and make resources available to start a project or programme. Planning is a crucial phase in which the goals are operationalised and the work is organized. During the execution of the plan, strength is developed by building on available success factors, but weakend by the presence of barriers to overcome. Depending on the outcome of this realisation phase the results are matching the objectives more or less. Governance is a crucial factor of influence during all the phases. The work is executed within an ever changing context which may influence all aspects of the initiative. These implementation aspects are visualised in the Smart City implementation model.

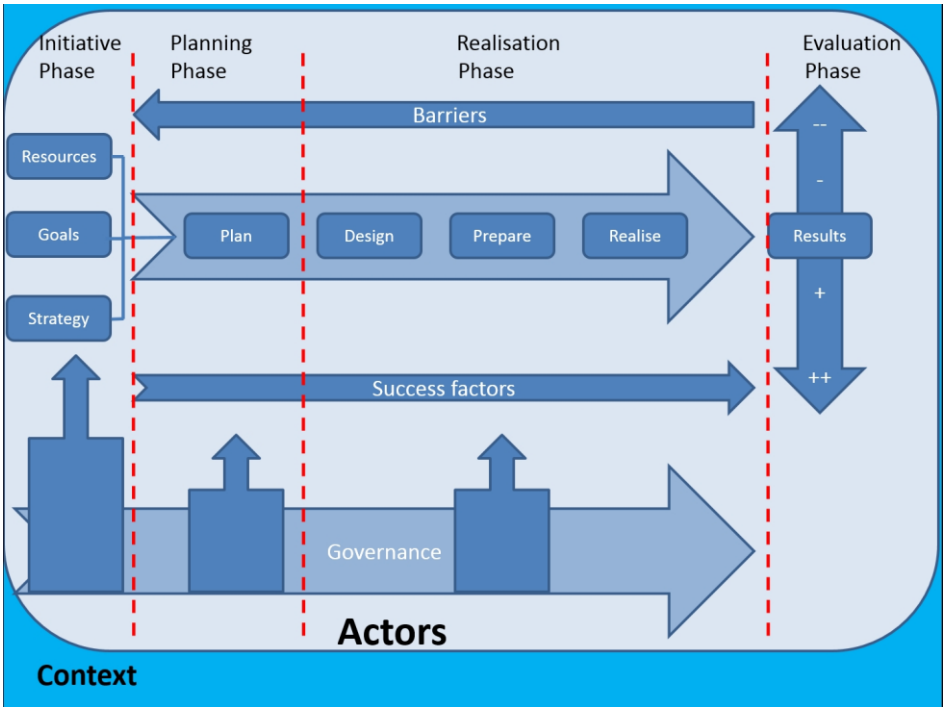


Fig. 2.3 Smart City implementation model

In this thesis I will refer to 'implementation power' as the strengths of the involved stakeholders to realise the objectives of the Smart City initiative. This 'implementation power' originates from the competencies (knowledge, skills and attitude) of the people involved, the available means and the facilitating organization. The 'implementation power' developed by the organisation is also largely dependent on the attractiveness of the objectives and the vision it is based on for the participants.

Bolivar found three main directions for the followed approaches in Smart City implementations, with a main accent on a pragmatic focus:

> Although there is no one route to becoming smart, and different cities have adopted different approaches that reflect their particular circumstances, three general principles to guide smart city agendas have included the integration with economic development and public service delivery plans, the pragmatic focus with the bulk of investment going on projects that are practical, achievable and financially viable and, finally, the participation of community representatives, local businesses and residents to ensure projects are relevant to the city's opportunities and challenges. To achieve these aims, governments must use ICTs to improve political participation, implement public policies or providing public sector services (Bolívar, 2015).

A 'Strategy' can be applicable on different levels of action. At first it refers to the action of setting goals, but the main focus of strategy is then on determining the path to go (How?), given a specific situation. The core aspects of a Smart City initiative are thus all strategic (Why?, What? and How?), as shown in this table by Peek.

Why?	*What?*		*How? (technology)*		*How? (organisation)*	
Sustainability	Resources	Utilising	Infrastructures	Communicating	Public	Providing conditions
Resilience	Economy	Adding value	Buildings	Producing	Private	Investing
Quality of life	Politics	Connecting	Places	Meeting	Individuals	Participating

Table 2.3 Core-aspects of the Smart City approach (Peek & Troxler, 2014)

Since the Governance of Smart City initiatives is mainly concerned with the 'How' aspects it is relevant to consider the different possible answers on this question. From the literature on Smart City implementations the different approaches will be described.

Like many ambitious change initiatives, Smart City initiatives can bear the burden of sky high expectations, being tempered by the more than expected effort and time needed to realize only a part of it. Although high expectations are often needed to raise awareness and willingness, obtain funding and enthusiasm, management of realistic expectations is a success factor from the very beginning. Kim (2015) observed the tension between 'marketing' and 'realization' and pleads for *realistic expectations* as a success factor.

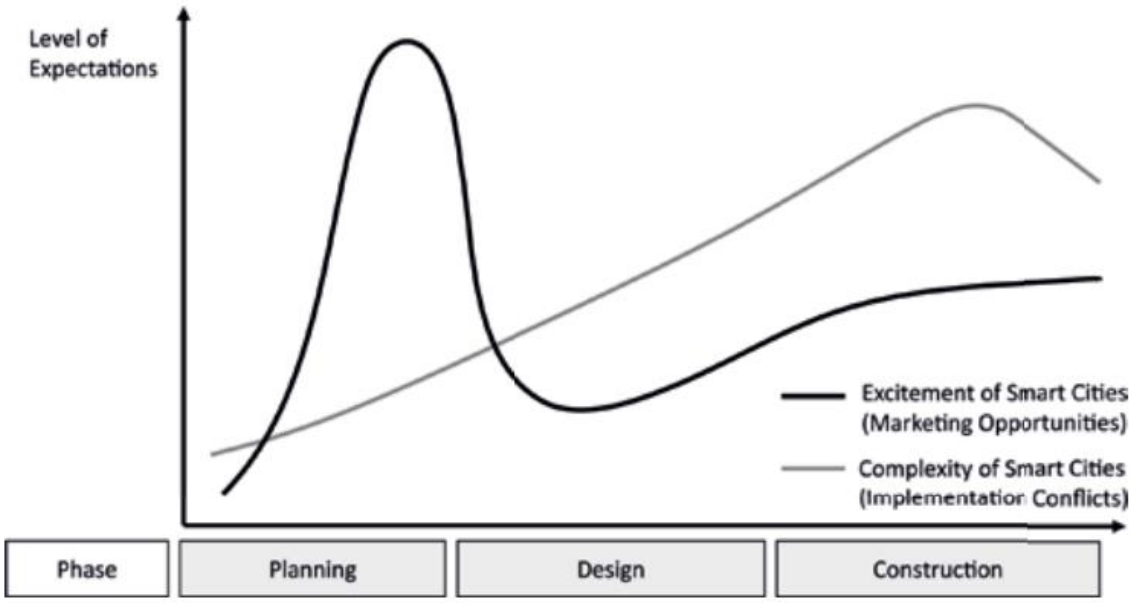


Fig. 2.4 Excitement and Complexity Cycles for Smart City implementation (Kim, 2015)

The figure above shows that Smart City implementation conflicts often are continuously on the rise, during the life cycle of a Smart City Project, whilst towards the end of the planning phase the level of expectations and the excitement of the market opportunities drops dramatically. This makes it difficult to overcome the planning phase and actually design and implement the Smart City project.

3.1 Scope: National versus local strategies, existing or new city development

The scope of an initiative is determined by two main factors: the scale and the status of the domain. The implementation strategy is influenced by the scale of the Smart City initiative: is it focussing on a national level, or on a regional or urban level. The higher the level the more stakeholders will be involved and the more risk on discontinuity on the political levels and the more complex the legal and policy items can be.

Angelidou (2014b) gives an overview of the advantages and disadvantages of a local scale from the literature. Relevant because the cases in this thesis have a local scale. It shows more advantages than disadvantages for operating on the local scale. The aspects direct related to Governance are summarized in the table below.

Advantage	**Source**
The importance of collaboration among public and private actors, and most importantly the engagement of the city's people, in order to design socially sustainable and liveable smart cities	(Bria, 2012; Paskaleva, 2011; Sassen, 2011;Townsend et al., 2010).
Cities are capable of engaging various constituents in the innovation process on a much broader range of activities, fostering citizen-centric governance; the result is well established smart city ecosystems	(Bria, 2012, Hodgkinson, 2011, Paskaleva, 2011 and Streitz, 2011).
Cities are more flexible in exploring and adjusting a variety of business and governance models to their own profit. Their experience, agility and proximity provide them the necessary knowledge and ability to set up a favourable climate for the purposes of becoming smart	(Hodgkinson, 2011).

Disadvantage	
Small and medium sized cities compete for resources against larger and better-equipped cities; therefore they are less likely to be able to receive or afford the necessary funds for smart city projects	Giffinger et al., 2010).

Table 3.1.1 advantages and disadvantages of local initiatives related to Governance aspects (Angelidou, 2014; Ibrahim et al., 2015)

Besides the scale, the status of the domain is also an important factor in the scope of an initiative. The main differentiator here is the distinction between new development ('green field') and improvement of an existing city or area ('brown field').

Angelidou (Angelidou, 2014) also gives an overview from the literature of the advantages and disadvantages of adjusting an existing city which is summarized in the table below. This is particularly relevant because the cases in this thesis are also situated in existing cities. There are as many advantages as disadvantages summarized. The aspects directly related to Governance are summarized in the next table.

Advantage	**Source**
Opportunity of employing open innovation techniques and a bottom-up approach (crowdsourcing, user engagement, living labs, open data, etc.) to accelerate the innovation process	(Bakici, 2012; Bria, 2012; Paskaleva, 2011; Schaffers, Komninos, & Pallot, 2012; Schuurman, Baccarne, de Marez, &Mechant, 2012; Vicini, Bellini, & Sanna, 2012a).
An ecosystem of stakeholders is already present, allowing for innovatory ways to collaborate and secure funding	
Disadvantage	**Source**
Complex ecosystems of people, institutions and stakeholders require extreme effort to organize and discipline	(Bélissent,2010; Ratti & Townsend, 2011).
Besides becoming 'smart', existing cities have many problems that must be addressed and which compete for a share of the city's recourses. Therefore, it is not possible to address all aspects of a smart city; the strategy has to be highly selective and based on a laborious prioritization process	(Bélissent, 2010).

Table XX Governance related advantages and disadvantages of making an existing city Smart (Angelidou, 2014)

The dimensions 'scale' and 'domain status' determine the scope of an initiative with a heavy impact on the possible implementation strategies. The strategies in the case studies on Amsterdam and Eindhoven are to typify as 'local brown field'. This scope implies a number of advantages and disadvantages which will influence the governance style of the Smart City initiative.

3.1.1 Stakeholder collaboration

Main player among the stakeholders are the government(s) on urban, regional and/or national level. Like in traditional urban development programs they work together with numerous companies and institutions, depending on the objectives of a specific initiative. Very often the public-private partnership (PPP-model) is the framework for the cooperation between the stakeholders as in more conventional urban development projects. As there is a power shift in urban development in the Netherlands, from the Rhineland model towards the Anglo-Saxon model, so is there a shift in Smart City implementation.

Stakeholders are a dominant factor in determining an implementation strategy as they are a dominant factor of the city itself. The main stakeholders are:

- Political leaders, managers and operators of local city-government;

- The service operators – public or private: water, electricity, gas, communication, transport, waste, education, etc.;
- End users and consumers: inhabitants and local business representatives;
- Investors: private banks, venture capitalists, pension funds, international banks;
- Solution providers: ICT companies, financial and investor providers.

Given to each of these groups a true stake in smart city development is important to achieve the necessary consensus for the changes. Their concerns need to be carefully considered and acknowledged, and ultimately the direction and next steps have to be collectively approved (Commission, 2014).

The different stakeholders play different roles within the organization of a Smart City initiative. The table 'stakeholder coordination' gives an overview of different actors and their roles, by the European Innovation Partnership on Smart Cities and Communities:

Actor	Key Role(s)
European Institutions	- Convening action - Setting and supporting policy and regulation where adequate - Supporting standardisation - Providing funds for research, innovation and large-scale deployment through intelligently combining Horizon 2020, COSME, ESIF funds and other financing tools - Promoting awards, competitions, dissemination, learning
Member State and Regional Governments	- Providing supportive legislative, policy and regulatory environment - Establishing innovation programmes - Supporting (national/regional) city competitiveness / competitions - Providing funds, and supporting the establishment of funding vehicles - Risk management - Market development activities (e.g. international trade missions)
Investors	- Commercial models that support collaboration and common solutions - Funds that enable the OIP ambitions of early scale
City Administration	- Leadership - Societal engagement - Policy, programmes, capacity building
City Associations and Networks	- Collaboration mechanisms - Benchmarking - Experience sharing and dissemination
Industry	- Innovations - Solutions - Research resources - New business models
Academia / RTOs / EERA	- Insight development, research capability, scientific support along the entire value chain - Independent validation - Dissemination - Discussion forum
Society	- Ideas, opinion, feedback - Engagement on service operations

Table: 2.4 Smart City Stakeholders and their roles (Sherpa Group, 2013).

The chosen strategy in specific Smart City initiatives is heavily depending on the perspective of these stakeholders. "Two of those extreme approaches and a final one that aims to meet them in the middle are: the top-down Smart City, the bottom-up Smart City, and the Smart City as a local innovation platform" (Walravens, 2015). With Smart City programs becoming more ambitious the collaboration between stakeholders becomes an even more dominant factor in the strategy. As a result from practice and supra-national stimulation by the EU the focus is at new models for collaboration like 'the triple helix model' and 'multiple helix' or 'quadruple helix' cooperation. Walravens pleads to keep the focus on a holistic view:

> a purely top-down view on the Smart City carries a danger of authoritarianism with it, while a bottom-up-only approach leans towards chaos and lack of long-term vision. We argue that rather than trying to find the perfect definition for what the Smart City is or should be, closely looking at who is making claims about the Smart City, with which motivations and consequences, is at least equally important. Approaching the concept using the three characteristics presented above (Top-down, bottom-up or middle-out) is one way of trying to keep this holistic perspective (Walravens, 2015).

Suzuki (2015) talks about different leadership patterns to create data infrastructure in Smart Cities, mentioning 'the middle out approach', as a form, putting both the data and stakeholders at the centre of interest. Based on having a strong value network of collaborators, of having feedback loops to understand user's perceived value which will help decision makers to assess whether the delivered value matches the expected value of users is of high importance. Finally the implementation of efficient governance strategies is necessary since governance can reduce behavioural complexity.

Smart City Maturity of the stakeholders

In a way the chosen strategy is dependent on the maturity of the stakeholders with respect to the Smart City concept. Boyd Cohen (2015) distinguishes three maturity levels in his weblog 'The 3 Generations Of Smart Cities. Inside the development of the technology driven city' (Cohen, 2015). Early adopters grow in maturity, while followers can build on former expertise and step in at a higher generation level.

These different top-down and bottom-up approaches relate to policy framework conditions for system innovation, and the three different policy paradigms presented in chapter 2.5 'Influencing factors Smart City Frameworks'.

Smart Cities 1.0 'Technology push': The first stage in Smart City development is characterized by the technology push. City government is seduced by multinational companies with their vision of a future ideal urban society, while they are not yet capable of understanding the effects of integrated technology on urban life. Extreme examples of these cities are PlanIT in Portugal and Songdo in South Korea. In this case "Technology providers play an important role in partnering cities; in particular, major global technology providers such as IBM, Cisco, and Siemens. These companies have been heavily involved in efforts to encourage cities in the adoption of ICTs and new technology. These efforts are often framed in the context of sustainable development" (Ching, 2013). One can say that 'Technology push' may refer to a lack of strategy at the involved government.

Smart Cities 2.0 'Demand pull': In this next stage politicians take the initiative and define the outcome of the initiative. In this case demand pull can thus be a top-down strategy. Technological possibilities are examined on their contribution to the desired improvement of the quality of life in the city. According to Wolfram, the main strategies for implementing this concept of the Smart City is either by shaping 'Smart City' alliances (triple-helix model), or by designing service incubators (open innovation ecosystems) (Wolfram, 2012). According to most rankings the 'most progressive' smart cities are functioning in this stage, like for example Barcelona.

Smart Cities 3.0 'Co-creation involving citizens/Open innovation platforms': A relative new form of collaboration in Smart City initiatives is the situation in which co-creation with citizens is the chosen model for development. For example in Vienna, where citizens are getting involved as investors in local sustainable energy supply. "Cities like Amsterdam and Seoul seem to be taking the early lead in promoting sharing activities amongst citizens and fostering sharing start-ups" (Boyd Cohen, 2015). The importance of participation of citizens and their organizations is currently widely underwritten, and has become a key aspect of Smart Cities: "All of the most used models in smart cities projects

take into account the social participation as one of the crucial features to involve stakeholders and to enable their actions in supporting the urban governance process" (Bifulco et al., 2013).

The different policy approaches can be found in the different maturity stages, although the more recent focus on open innovation platforms matches solely with the third maturity stage.

Policy / Maturity level	**1.0 Tech.Push**	**2.0 Demand Pull**	**3.0 Co-creation**
Top Down	X	X	
Middle out			X
Bottom Up	X	X	

Table XX possible combinations of strategy factors policy and maturity levels;

What approach will be most suitable for Smart City development? There are many views on this, however, it seems the answer lies in the middle. Schaffers, Rati and Komninos (2012) state, most practitioners and researchers agree that "If we leave government and IT giants to their own devices, we end up with a world of Songdos" (bron). Townsend, known by his book 'Smart Cities: Big Data, civic hackers, and the question for a new utopia', warns for "wonderfully engineered, technologically advanced ghettos. The alternative – open-sourced data, planners working with civil society, hackers with poor communities, smart sensors running alongside smartphones – could improve city life". For Townsend, 'somewhere in the middle' is the more bright future (Smedley, 2013). This is substantiated by Owen (2014), focusing on radical Smart City innovation:

> Neither the top down nor bottom up approach will necessarily lead to disruption that could truly transform a system. They are about making the current system more efficient. We know technology can transform cities – but to achieve its potential it may need to create wholly new forms of organization rather than making the current ones more efficient (Owen, Mitchell, & Gouldson, 2014).

3.2 Influencing factors: Smart City Frameworks

Michael Batty, an architect-planner at University College London stated "There are almost as many approaches to understanding cities as there are commentators trying to make sense of this complexity" (Smedley, 2013). The broad range of Smart City frameworks to describe the concept is dazzling. Researchers have presented many types of frameworks suitable to fit their message and support their view on the Smart City concept. In this paragraph I will present the framework by Chourabi et.al. (2012), because – based on an analysis of different frameworks (see Appendix IV) - I concluded that this is the most elaborated framework for understanding Smart City initiatives.

Many frameworks are rather broad in their perception. Many publications stress the fact that Smart City initiatives originate frequently from a technology push with a high risk to neglect other relevant factors. Below I present a short overview.

Nam and Pardo (2011) think "a socio-technical view on the smart city is needed". Not technologies, but social factors are central to failure or success of smart city initiatives (Nam, 2011 #9; Mora, 2015). They see the Smart City concept as an organic connection among technological, human and institutional components. According to Nam and Pardo (2011) these three factors are influencing the six characteristics of a Smart City. These characteristics can be seen as the objectives or 'smartness in certain areas' for a particular Smart City initiative and match those defined by the EU (European Union, 2014).

In another publication, from this *socio-technical* viewpoint, Nam and Pardo (2011b) focus on the Smart City as Urban Innovation. This article provides a Framework for Smart City innovation, which shows *four dimensions* (Technology, organization, policy and context) in relation to *ways to change the government service delivery* (innovation), *related risks* (Risk) and *ways to deal with this risk* while innovating (way to success). These *ways to success* consist of generic and vague solutions and recommendations. For example, 'governance' is 'the way to success'. How this governance should be implemented is undescribed. They do stress the strategic directions of a Smart City for Technology factors is *integration*, for human factors is *learning,* for Institutional factors is *governance* (Nam & Pardo, 2011b).

Walravens (2015) describes in her Smart City model the importance of a holistic view on the Smart City concept and places the accent on three so called characteristics 'Collective' (aiming to tackle grand societal challenges), 'Contextual' (making sense out of the data flood) and 'Collaborative' (working with all stakeholders, including citizens, using open innovation methods).

Dameri (2013) has produced two models defining the essential elements of the Smart City concept: "The smart city governance is a crucial activity to grant the success of smart initiatives. Indeed, governance is the process able to address all the individual behaviours towards a common vision and goals of all the initiatives". In both the comprehensive scheme and the development path of a Smart City, Dameri gives a central role to governance, however stays superficial in explaining the meaning of governance.

The framework by Chourabi et al. (2012) in their paper 'Understanding Smart Cities: An Integrative Framework' has a higher level of determination and more detailed description. They identify eight critical influencing factors of Smart City initiatives: management and organization, technology, governance, policy context, people and communities, economy, built infrastructure, and natural environment. In this framework distinction is made between two levels of influence on the smart city initiative. The first level with the most direct influence is formed by the triangle: Technology, Organization and Policy (TOP); the same factors as distinguished earlier by Nam and Pardo. The second level identifies five major contextual factors of influence on the first level factors, in my interpretation a crystallization of the factor 'context' also previously mentioned by Nam and Pardo (2011).

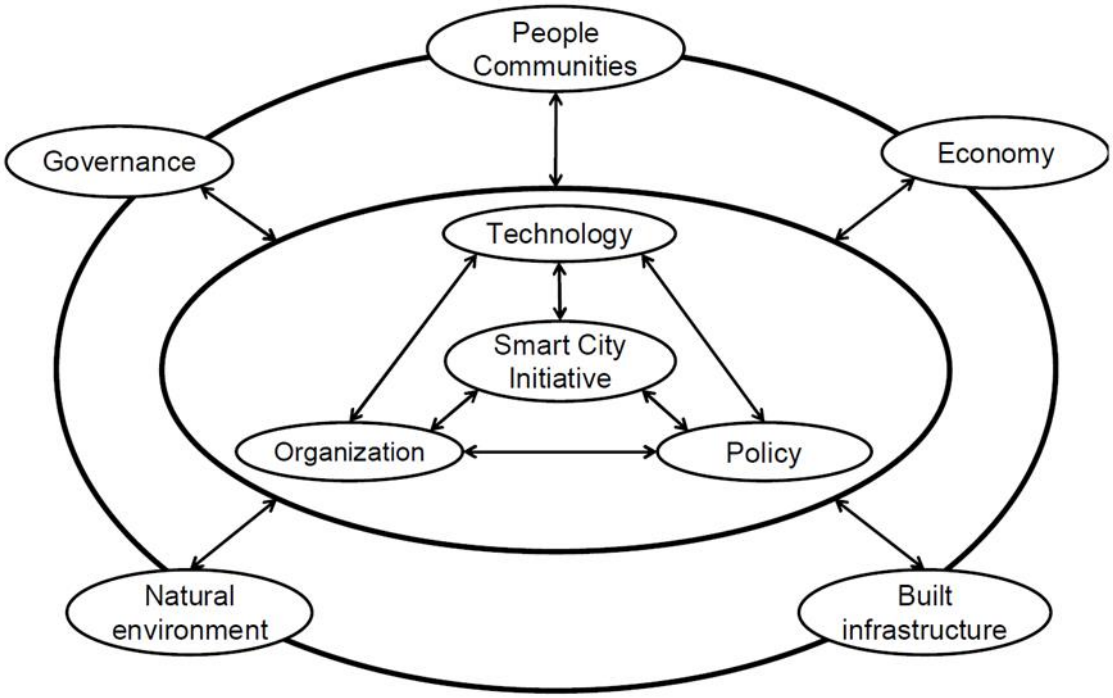


Figure XX Understanding Smart Cities: An Integrative Framework (Chourabi et.al 2012).

Each factor is elaborated on by the authors. The framework could be used to address practical development issues of specific initiatives in case study research. The distinguished factors support the categorization and description of influencing factors found in the research literature, supporting a better understanding of implementing Smart City initiatives. From the eight influencing factors the core elements and Governance will be described below by summarizing the explanation from the *original paper*, together with their main findings from the case study paper 'Building Understanding from Smart City initiatives' (Alawadhi et al., 2012). The complete description of all eight factors is included in Appendix IV 'Smart City frameworks'.

Based on this framework I analysed the Smart City literature for success and fail factors. In the appendices I and II lists are presented of the success factors and barriers for every factor in the framework.

(1) Management and organization

Original paper: Based on E-government success factors and barriers for M&O: Project size; Manager's attitudes and Behaviour; Users or organizational diversity; Alignment of organizational goals and project; Multiple or conflicting goals; Resistance to change; Turf and conflicts; Project team skills and expertise; Well-skilled and respected IT leader (tech-social skills); Clear and realistic goals; Identification of relevant stakeholders; End-user involvement; Planning; Clear milestones and measurable deliverables; Good communication; Previous business process improvement; Adequate training; Adequate and innovative funding; Current or best practices review.

Main findings M&O: The role of a leading organization is essential, managing involves interdepartmental collaboration, the initiatives change organizational culture and vice versa, the role of the top management and leadership is critically important, limited funding continues as a major challenge.

(2) Technology

Original paper: The integration of ICT with development projects can change the urban landscape of a city and offer a number of potential opportunities, they can enhance the management and functioning of a city. City managers should consider certain factors when implementing ICT with regard to resource availability, capacity, and institutional willingness, also with regards to inequality, digital divide and changing culture and habits.

Main findings technology: New technologies for back office functions are used for the initiatives, social media and smart phone are increasingly used, and the lack of staff and budgetary constraints are main challenges.

(3) Policy

Original paper: Political components represent various political elements (city council, city government, and city major) and external pressures such as policy agendas and politics that may affect the outcomes of IT initiatives. Institutional readiness such as removing legal and regulatory barriers is important for smooth implementation of Smart City initiatives. E-government success factors identified are: legal, regulatory, institutional and environmental challenges. Smart city initiatives face similar challenges which influence the policy context.

Main findings policy: Interdepartmental agreements and the executives' policy directions shape policy context.

(4) Governance

Original paper: Governance, involves the implementation of processes with constituents who exchange information according to rules and standards in order to achieve goals and objectives. Stakeholders' relations is one of the critical factors to determine success or failure. 'Stakeholder relations' refers to four main issues: the ability to cooperate among stakeholders, support of leadership, structure of alliances and working under different jurisdictions. The recollected factors are: Collaboration; Leadership and champion; Participation and partnership; Communication; Data-exchange; Service and application integration; Accountability; Transparency.

Main findings governance: Various types of governance models and governance bodies exist, governance encompasses programmatic directions, budgetary and resource allocations the interactions with external actors as well as internal partnerships with other departments agencies.

Conclusion

The described models put different accents on aspects of the Smart City concept. Almost every model has in some form the distinction between the three core elements: technology, organization and human aspects. Most models incorporate the objectives of Smart City development as a core influencing aspect. Governance is a key element in most frameworks. The model of Chourabi et.al (2012) is the most detailed and can be underpinned with descriptions of success and fail factors for each aspect of the model (see Appendices I and II). The model forms the integration of different models from the involved group of researchers.

3.3 Most critical factor Smart City Implementation

Given the clear view of the wide range of factors influencing a Smart City initiative, what factor is most relevant to Smart City implementation for this research?

According to research by Forrester in (2011) “Smart Governance is the core of Smart City initiatives” (Belissent, 2011b), and also according to Alawadhi et al.(2012) “Governance structures are embedded in all stages of any project”.

Dameri (2013) relates to the essential dimension of governance in Smart City implementation, seeing the importance of “the role of public government in driving the strategic goals of smart cities and in influencing the private investments towards the right directions for the city well-being and quality of life”(p.). She sees the lack of governance as a high risk factor:

> the lack of the governance (both at local or central level) in establishing the general policies and rules for smart city implementation produces a dispersion of investments and a loss of important synergies, economies of scale and scope, to improve the return on investments in smart city . . . to support the further concrete implementation of smart cities (Dameri, 2013).

Dameri and Rosenthal-Sabroux (2014) point at ‘governance’ as a central factor for further research:

> All cities are at an early stage in smart city development; nowadays all the projects have mainly the role to experiment initiatives and to collect best practices, but in the future these projects should become daily work to improve the quality of life in cities. Therefore, to be able to govern the smart city will be the most important weapon to reach substantial results. There is need for a governance framework for effective realization (Dameri & Rosenthal-Sabroux, 2014).

Chourabi et al. (2012) found that “several cities have felt an increased need for better governance to manage these projects and initiatives”(p.) . They argue that “Internal and external governance influence participatory and collaborative decision making”(p.) . Furthermore they discovered many models and governance bodies exist: “Participatory, hierarchical, and/or hybrid models are found in various initiatives.” However, how these different models actually work is not described. Therefore they stress the importance of the "need for better governance to manage initiatives or projects to make a city smart” (Chourabi et al., 2012).

The academic publication ‘Exploratory research on success factors and challenges of Smart City Projects’, by Kogan (2014) analysed thirteen Smart City initiatives from around the world, mainly focusing on European cases, using the eight factor Smart City model by Chourabi et al. (2012). From these cases Kogan derives that “citizen’s engagement and governance of the city is highly important.” Her main findings in this study are “besides such core factors as ICT, Open Data, which were previously considered the central part of the Smart City Model this analysis discovered that Human and Social Capital, Governance and most of all, Civic Engagement factors cannot be ignored. These factors are indispensable for the success of the Smart City Project” (Kogan & Lee, 2014).

Like Chourabi et. al (2012), Kogan’s research is only focusing on general success factors and challenges, and not so much on solutions, explaining how governance should improve Smart City implementation: "the results of this research serve as a very general outlook for the existing and future Smart City Projects" (Kogan & Lee, 2014). A good reason to analyse ‘Governance’ in the next chapter.

Finally, Byland (2015) stated “I guess all [Urban] transition roads lead to governance. . . As governance is always bound up with what path to take, what next steps to take and future states to arrange” (Byland 2015). The theme of urban governance and participation is therefore a thematic priority for the JPI Urban Europe Research and Innovation Agenda. The importance of the barriers on Governance aspects is supported by a study on identifying and overcoming barriers in urban climate adaptation (which relates to a broad field of initiatives, among which Smart City projects). This study uses a different analytic model but confirms that institutional and governance issues are the most

frequently encountered barriers, in glaring contrast to the low number of barriers related to technology issues.

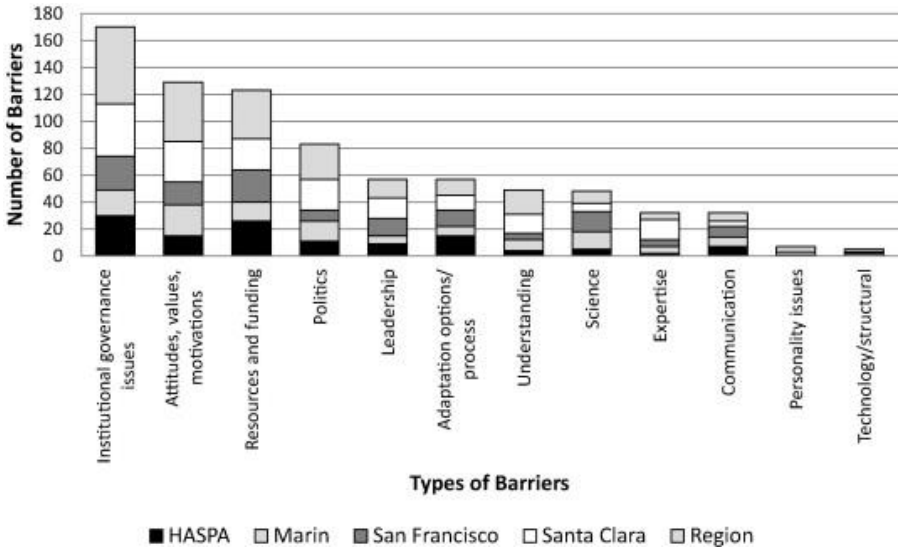


Fig XX Identifying and overcoming barriers in urban climate adaptation: case study findings from the San Franscisco Bay Area, Ca, USA. (Ekstrom & Moser, 2014)

These observations confirm the need of the public action, especially focusing on governance, policies and rules, rather than funding or technology and steer in the direction of discovering ways 'how' to improve Smart City implementation through governance.

3.4 Critique on the Smart City initiatives

Critique on the Smart City initiatives comes from different perspectives. Major criticism is concerning the concept of 'Smart Cities' itself and the major role of ICT within the concept. The lack of evidence for proven success is a second area for criticism and tempering the expectations. Besides that there is some criticism on neglected possible risks as a side effect of the realization of 'Smart Cities'.

In the Netherlands Maarten Hajer and Ton Dassen (Netherlands Environmental Assessment Agency) published a book called 'Smart about Cities - Visualising the challenge for 21st century urbanism'. They point out at the risks of the current hype: "The discourse on 'Smart Cities' is everywhere. It promises an era of innovative urban planning, driven by smart urban technologies that will make cities safer, cleaner and, above all, more efficient. Efficiency seems uncontroversial but does it for great cities?" (Hajer & Dassen, 2014). Hajer and Dassen plea for a 'smart urbanism' instead of uncritically adopting 'smart cities'. They question the reliability of ICT claims in improving the city and are critical towards the Smart City concept and their potential benefits. According to them "the concept of 'Smart Cities' currently mobilise much positive energy among the elite, and its discourse is truly of the 21st century . . . however, It lacks connection to a broader social reform agenda" (Hajer & Dassen, 2014, p. 31).

Walravens finds criticism on different aspects of the Smart City concept: "The various operationalizations of the Smart City, the different interests at play, the potential misuse or even abuse of the concept at its potential pitfalls also constitute recurring critiques" (Walravens, 2015).

Some researchers warn for a too dominant role of ICT (Caragliu et al., 2011). In a more extreme case, researchers state cities who have a broader portfolio of investments in smart initiatives are not

necessarily better or more liveable cities. Rather than reaching a good level of democracy and quality of life, these cities could turn into panoptical environments in which the citizens are persistently observed and scrutinised (Neirotti et al., 2014). In this line, Anthony Townsend is focusing on the possible negative aspects of the permanent data collection since people have been enhanced with mobile computers in their smart phones: “Increasingly, mobile networks themselves are becoming observatories where we can watch in real time how people move, how cities grow, the quality of life, and economic activity” (Townsend, 2013).

The use of ICT may have an enforcing effect on democratic processes, it can have unwanted side effects: “it [the smart city] is an increasingly authoritarian and undemocratic place, aimed at users and consumers rather than at citizens. These are invariably privately owned and privately controlled places, albeit ones often propped up by public subsidy” (Minton, 2014).

Baccarne, Mechant and Schuurman (2014) focus their critique on the lack of evidence for positive outcomes: “While both research and policy often promise disruptive solutions, improvement of life in the city and economic growth, there is a vast lack of evidence concerning the actual value that is being created in a smart city and the processes that allow the exchange of value and knowledge” (Baccarne et al., 2014).The European study ‘Mapping Smart Cities in the EU’ showed that evaluation of the outcomes is complicated by:

> the absence of objectives stated in concrete and measurable terms, and by the lack of identified and agreed baselines for comparison. Even where partial indicators are identified . . . the data necessary to assess performance are not always collected, made available, or provided at the necessary levels of quality and coverage (European Union, 2014).

And for cases in which value is created by these Smart City initiatives, researchers emphasize on the minimal effect they have: “The popular perception of smart city initiatives as an overarching, citywide urban policy concern often narrows its focus onto much smaller deliverables that may have minimal effect” (Shelton, Zook, & Wiig, 2014). According to Dameri & Rosenthal-Sabroux (2014) the ‘measurement of the results’ is strongly related to the ‘will to invest’ in Smart City initiative:

> No city till now has developed and applied a set of key performance indicators and a measurement framework to evaluate the real effectiveness of smart actions. For smart city development, in a large sense, it is difficult to evaluate the returns they produce. More difficult is to evaluate the benefits or the public value produced by an integrated smart strategy. It is an important barrier to smart initiative implementation, because they often require a large amount of public investment and therefore also the need to justify the expenses and to demonstrate the reached results (Dameri & Rosenthal-Sabroux, 2014).

Finally Caragliu (2011) points at the risk of neglecting other potential better ways to strive for a better future by focusing on the Smart City concept (Caragliu et al., 2011).

3.5 Conclusions

What is a Smart City? The literature analysis gives us insight in the Smart City concept. For this thesis the EU working definition of Smart Cities has proven to be a useful description of the relevant factors: ‘A city seeking to address public issues via ICT-based solutions on the basis of a multi-stakeholder, municipally based partnership’.

What factors influence Smart City implementation? Since there are different views on the concept of Smart Cities there are different views on the influencing factors. From the study of different frameworks for the Smart City concept, the ‘Integrative Framework’ from Chourabi et.al (2014)

stands out as the best suitable to sum up the key influencing factors and demonstrate the relations between them. The model includes the perspective that the Smart City is not driven by technology alone, but that policy and organizational issues are also key drivers. The model embeds the Smart City initiative in a number of more contextual influencing factors among which Governance. This model is evolved on the base of some of the described models and from different actors, contains the most recent insights and is based on descriptions of all factors with concrete lists of sub-factors.

In my view, based on my broad analysis of research on success and fail factors[1] the 'Integrative framework' gives the answer to the research question what the influencing factors on Smart City implementations are and which are the most important.

According to most of the analysed literature within this framework Governance, Organization and Policy are the dominant factors to influence the success of any smart city implementation.

In renewing the city, the establishment of 'governance' is a key influencing factor, by adjusting the classic governance to a more open and participating cooperation between designers, developers and citizens forming a multi-stakeholder, municipally based partnership. This will be further analysed in chapter four.

Smart City initiatives are mostly 'smart' because of their chosen objectives and used technology; urban area development is not a core objective in most initiatives but the improvement of urban services is.

'Smart City' is not a well-defined label and it will probably never become so defined before being replaced by a new label. This happened already to the 'digital city' and the 'intelligent city'. The city marketers will continuously be looking around for new labels to distinguish their cities and form an attractive leading group. No city wants to be 'dumb', so being 'smart' is at best a temporary advantage on the rest. At long last all cities strive to be smart, so the adjective will lose its meaning. Just like 'e-mail' is being expelled by 'mail', all 'Smart Cities' will eventually become 'cities' again.

Since 'smart' is a human quality it's quite obvious that a Smart City initiative has focus on the participation of smart people. The use of 'smart technology' can make them even smarter. The current cultural connotation of being smart is also 'seeing the bigger picture' or 'using the holistic view'.

Measurement of the outcome of any Smart City initiative is a prerequisite like it is for any initiative based on public funding, therefore the objectives, adjustment and evaluation should be part of the democratic process.

The criticism on Smart Cities is focused around the dominating role of technology and thereby its providers, with the risk of under estimating the possible negative side effects like the possible reduction of democratic control and citizens' participation. The potential 'big brother' dimension which should always be addressed explicitly with built-in measures to secure the privacy of citizens and the flow of democratic processes. Another critical perspective is to focus on the real proof of the measurable realization of the objectives. Using the 'integrative framework' and paying attention to the eight main influencing factors identified above, these potential pitfalls may be avoided.

[1] An overview of Success factors and barriers for all factors of Chourabi's model is not incorporated in this thesis because of its size. However the document can be obtained by sending a request to nikanderhartemink@gmail.com

4 The Role of Governance in Smart City Implementations

Research Question: How can governance factors contribute to successful implementation of Smart City initiatives?

In Urban Area Development and more specific in Smart City literature, the need for good governance is more and more stressed as a global success factor, but what is governance within this specific context? In this chapter I will focus on gathering the body of knowledge necessary for this research. It will start regarding the governance in urban development before introducing governance in a Smart City. There is a direct link between governance factors influencing urban development and governance factors influencing Smart City initiatives. Thus understanding urban development is a necessary prerequisite for understanding what the possible success factors and barriers in Smart City governance are.

As Kim (2015) puts it "The nature of smart cities is based on the concept of governance, while the planning practice is still in the notion of government" (Kim, 2015).

Origin of governance

In general the term 'governance' is used for activities and processes with the objective to improve the management of and reduce the risks for an organization. In this form it originates from the financial world where since 1988 improvements have taken place under the Basel I and II agreements which focus on financial stability, reduced risks for stakeholders, transparency in the information provision and improved internal control and supervision. Governance in this context refers to the division of management tasks and responsibilities and the transparency of decision making within legal entities like companies and institutions.

A general trend is currently to use the term 'governance' beside the term 'government'. Both terms relate to the verb to 'govern', with 'government' relating to the institution that traditionally has to perform the task of 'governing' in relative simple hierarchical networks, reserving 'governance' for the processes of collective governing in more complex networks of stakeholders without that hierarchical structure and line of command and control. **The term 'governance' refers to all processes to bundle activities of all stakeholders and create an optimal environment to realize agreed upon objectives.**

In the modern Western society policy-making used to be the preserve of traditional hierarchies but more and more this process occurs through the interaction of 'stakeholders'. As Kooiman observes:

> These interactions are … based on the recognition of (inter) dependencies. No single actor, public or private, has all knowledge and information required to solve complex dynamic and diversified problems; no actor has sufficient overview to make the application of needed instruments effective; no single actor has sufficient action potential to dominate unilaterally in a particular government model (Kooiman, 2004).

This shows the need for governance to improve the process of interaction within complex networks.

4.1 Governance in Urban Development

Research Question: Which governance factors influence urban development implementation?

Overview of Urban Development in the Netherlands

Our cities are constantly changing: growing, shrinking, transforming and adapting to current times, therefore these cities need to be managed to deal with this change. In the Netherlands urban development is since the '90s of last century turning into an interactive process between different actors within the urban area. The major developments of the last 100 years are:

- Since the industrial revolution urban planning is widely applied to improve bad living conditions in the cities and led to the housing act in 1901;
- After WO II planning of urban development and reconstruction became significantly a political activity for local and national government;
- 70-80s: new approach in the form of integrated process;
- 90s: focus on planned implementation in an autocratic style. This proves to be ineffective and inefficient during time. The knowledge domain; 'Urban development' emerged as a new paradigm: market and government are interdependent and working together in special formed Public-Private-Partnerships; the term 'governance', was understood as 'the capacity to organize collective action toward specific goals';
- 2000s: the planning approach (from post-industrial zoning with a strong functional separation of function as working, housing, shopping) is exchanged for an approach of mixed use (multi-functional areas, offering better living conditions). The method of policy making is increasingly developed on the basis of consultation. Private parties are included at an increasingly earlier stage (Wigmans, 2001).
- The economic crisis of 2008 limited city budgets and forced the government to withdraw from certain domains, resulting in a societal trend towards limited government influence and empowerment of private parties and civil society. Government parties facilitate urban development, while private parties increasingly take initiatives (Heurkens, 2012).

Urban Development

The current urban environment is of a high complexity. As Healey states it, "a complex mixture of nodes and networks, places and flows, in which multiple relations, activities and values co-exist, interact, combine, conflict, oppress and generate creative synergy" (Healey, 2006). The development of this urban environment (often designated as 'spatial strategies') is not a simple top-down process anymore, but it "centres around collective action, both in formal government arenas and in informal mobilisation efforts, which seeks to influence the socio-spatial relations of an urban area, for various purposes and in pursuit of various values" (Healey, 2006). Also, according to Kooiman (1993), urban developments can be characterized by their complexity, dynamism, and diversity. "This characterization refers to both inter-urban and intra-urban issues. Of which inter-urban issues relate to the urban development in a spatial sense, while intra-urban issues concern the quality of life" (Kooiman, 1993). Whatever the issues, the involvement of many stakeholders does not necessarily lead to adequate policy. Top-down command-and-control is no longer appropriate and a form of collaborative governance by a group of stakeholders is more and more seen as the needed approach.

De Zeeuw and Franzen (2008) relates to this view by opting urban development is "the art of connecting functions, disciplines, actors, interests and financial flows, focusing on (re)development of an area" (de Zeeuw & Franzen, 2008). Peek and Franzen (2007) motivate that

> Urban area development may be defined as the integral development of a (large scale) area, in all its dimensions over a long period, with different stakeholders (public and private). There are no clear limits in terms of size, investment volume, or mere square meters.

> Complexity is the common denominator as both content and context of the development are complex as a result of a certain combination of the different elements (Peek & Franzen, 2007).

To get a grip on the complexity of urban development Peek and Franzen name five main disciplinary aspect: 1) public private partnership, 2) land assembly, 3) financial engineering, 4) urban design and 5) branding. This is similar to the viewpoint of Van Hoek and Wigmans (2011) who state urban development "combines aspects of governance, urban planning, economic development, financial management, social planning and marketing, and leads to a more integrated strategic decision-making process in which both public and private sectors participate" (Hoek & Wigmans, 2011). According to these visions 'governance' has become relevant as a mean of handling the current complexity in urban development.

4.1.1 What is Governance in the context of Urban development?

I will elaborate on the use and the meaning of the term 'governance' as it is referred to by different researchers to come to a clear definition of 'governance' in a Smart City context.

In Stoker's view 'governance' is a new alternative for 'government' in situations where networks of actors are a necessary condition to realize desired objectives. This puts the focus on network management activities when realizing governance (Stoker, 1998).

End of the 1990s, early 2000s, urban governance became the new catchphrase, varying from traditional forms of government having public sector involvement, now including actors from private and voluntary sectors, in which relationships between participants do not have to be balanced (Andersen & van Kempen, 2003).

Healy states "Governance can be seen as a framework for steering networks, as it is the capacity to bring together and bind actors with divergent perspectives" (Healey, 2007, p.17-19). He expressed the vagueness of the entity 'governance': "Governance has come into use to refer to all 'collective action' promoted as for public purposes, wider than the purposes of individual agents" (Healey, 2006).

To steer on urban complexity, the rise of governance holds opportunities for different stakeholders in the urban area and threats for the influence of elected democratic representatives:

> Governance acknowledges the existence of hybrid networks (local, regional and national) regarding policy, it also accepts the increasing role of private parties in public policy processes, both in setting the agenda and in implementing policies. Urban authorities have been forced to both cooperate and compete with various actors, networks and organisations, all of which strive for power and influence (Hoek & Wigmans, 2011).

Thus in urban development the municipality increasingly depends on private parties, other government bodies and decision making that takes place outside the realm of the municipal territory, as for Hoek & Wigmans governance:

> . . . is not limited to one actor. It mainly refers to the way in which the organization and decision making regarding area development have been regulated. All the different visions, interests and opinions that come into play during the trajectory are streamlined into a collaborative whole – this is governance. (Hoek & Wigmans, 2011)

This view on governance as a set of processes is also demonstrated by Daamen & Vries (2013), who describe the governance process as "the array of *activities* performed by actors involved in the on-going spatial changes inside today's […] city interface." (T. A. Daamen & Vries, 2013). This implies

that the activities of authorities are seen as part and parcel of all the governance work focused on these complex areas.

> Such activities influence the actual spatial changes being realized there, though they do not fully determine them. In practice, much depends on the capacity of the […] authority to enforce its spatial development decisions onto the other actors involved in the *governance process*. Institutions shape that capacity, but the *governance activities performed* are also understood to shape institutions (T. A. Daamen & Vries, 2013).

Daamen & Vries (2013) stress that the execution of *governance processes* is a result of the capacities of the different stakeholders, but that by performing the governance processes the stakeholders are affected in their norm, values, objectives and perhaps even structure.

Bossert (2004) gives a demarcation and definition of governance in terms of its objective and underlying processes: "To guarantee the mutually consistency of management, control, supervision and accountability of organizations, focused on the efficient and effective realization of policy agreements, and to communicate and offer accountability on these processes to all relevant stakeholders" (Bossert, 2004). Although this definition is developed in the context of the care practice it has all key elements and seems to fit well for the Smart City context.

From the cited literature I conclude that the concept 'governance' is alternatively seen as process, structure, order or capability; its nature remains somewhat unclear. For this reason I deduct my own definition of Governance combining some of the most relevant elements:

- It concerns collective activities from all stakeholders; these activities can best be described as processes;
- Because there is a situation in which central command and control won't be adequate to mobilize all parties needed;
- It supports the optimal integration and synergy of the powers and resources from the stakeholders;
- To realize the shared vision or objective and outcome.

Based on these elements I define 'Governance' for this thesis as:

The collective governing in more complex networks of stakeholders without hierarchical structure and line of command and control, meaning to bundle activities of all relevant parties and create an optimal environment to realize agreed upon objectives.

Challenges for governance

Governance is a complex concept in an even more complex and demanding environment of urban development. To make governance work will ask a great effort from all stakeholders, so in practice often problems with the execution of governance processes can be expected.

"In most cases, public actors have a shortage of resources land and capital. Differences in risk perception between public and private parties are a main source of tension in urban development projects" (T. Daamen, 2005).This quote shows that in the context of urban area development most initiatives have a large and diffuse set of stakeholders without an overarching hierarchical governing

body. In this multi-dimensional game many different coalitions and many conflicts may occur. According to Healy (2006)

> The main challenge for metropolitan governance is to find ways of organizing the connectivity between the different spheres of action, therefore urban governance advocates the inclusion of private and corporative interests as well as citizens and their associations in sharing in the power, control, responsibility and accountability of local development (Healey, 2006).

Andersen & van Kempen (2003) signalled that there are a number of governance related changes in urban policy: "a stronger focus on the empowerment of underprivileged groups and communities,… the reliance on area-based programmes, the move from sectorial to integrative policies, and the use of covenants or contracts between different parties involved in policy" (Andersen & van Kempen, 2003). It looks like these changes closely relate to the European funded Smart City projects.

According to De Bruijn & Ten Heuvelhof (2010), difficulties during the implementation phase are often that actors who want to change the urban landscape often find themselves involved in a network of dependency, thus compromise or consensus needs to be found (De Bruijn & Ten Heuvelhof, 2010).

Vranken et al. (2003) present a sort of implicit definition of governance by pointing out what fail factors can arise in the implementation of the concept:

> "Accountability (who is responsible for what), potential goal conflicts (whose goals should be worked on first), legitimacy and representations (who is representing whom and based on which mandate), if not properly dealt with, can easily obscure the core issue, lead to organizational chaos and impede local development" (Vranken, De Decker, & Van Nieuwenhuyze, 2003).

According to Rocco, lecturer at Spatial Planning & Strategy at the TU Delft, in a presentation on issues of governance in regional planning: there are six main issues of governance: 1) Hollowing out of the State 2) Accountability 3) Multilevel nature (complex structure cutting across decision levels) 4) Representation and visibility 5) Decoupling of the realm of politics 6) Composition of networks of governance (Rocco).

The most dominant governance factor in urban development is the mode of governance: the partnership and participation of the stakeholders, based on the kind of collaboration. This collaboration is the result of the fact that top-down control no longer is fully effective and that self-organizing networks and bottom up initiatives try to fill the gap.

On the one hand the challenges mentioned in this paragraph make clear that the concept of governance is descending from the governance development within private companies and public institutions, on the other hand it shows that the possible fail factors are a result of the unstructured situation between the different stakeholders.

4.1.2 Partnerships as mode of governance

To execute governance processes in collaborative networks different modes of cooperation have been developed to build upon and develop partnership between the stakeholders. From this perspective partnership can be seen as a mechanism or even mode of governance: "Partnership has

meant a redefinition of the role and domain of political-administrative authorities, allowing for private actors (commercial and non-commercial) in the delivery of welfare services . . . as well as community development" (Kickert, Klijn, & Koppenjan, 1997). They find a partnership as a mode of collaborative governance in urban areas that is also experienced largely in the Netherlands due to its neocorporatist tradition (Kickert et al., 1997).

Frantzeskaki et al. (2014) defined partnerships as: "collaborative arrangements important for implementing sustainability agendas due to two distinct and defining characteristics: (a) Partnerships create and catalyse synergies between partners … (b) Partnerships are flexible and versatile in the role they take up despite the problem context" (Frantzeskaki, Wittmayer, & Loorbach, 2014). The following includes an elaborate presentation for each type of the three (conceptualised) synergies that partnerships create based on an extensive literature review: Social synergies, resource synergies and governance synergies. Below an overview of Frantzeskaki et al. (2014) strengths and weaknesses of partnerships for service delivery in realizing urban sustainability in The Netherlands:

As **strengths** she finds partnerships create synergies between partners such as:

- *Social synergy* (creating trust, a channel to express ideas, concerns, problems outside official route, as well as about area-specific issues),
- *Governance and institutional synergy* (creating and enabling integration between departments and between different policies, institutionalize cross-sector cooperation while recognizing the 'jurisdictional integrity', create policy synergy by "combining the different perspectives of each partner" resulting in innovative solutions and arrangements, challenge and innovate ways of working, bringing about more streamlined decision-making or a more entrepreneurial way of working, simultaneously mechanisms whereby the public and voluntary sectors can challenge the private sector to adopt more 'social' short-term gain).
- *Resource synergy, including knowledge resources* (pool resources together: expertise, funds, skills and maintain social and economic profitability, manage and maintain infrastructures on the long-term in a resource efficient and effective manner, research partnerships in particular offer to innovation via research dialogues that connect "professional silos" Frantzeskaki et al. (2014).

As **weaknesses** she finds:

- *Uncertainty of delivery* (present a difficulty in delivering upon specified outcomes, focus on short-term outcomes hence short-lived, tolerate nurture strategic behaviour of partners that may diminish social values and benefits)
- *Accountability issues* (resist or hesitate to involve external stakeholders, present a difficulty in communicating and channelling common social messages and demands)
- *Contributing to fragmentation* (contribute to policy fragmentation in liberal institutional contexts)
- *Risk of inception of bad-practices* (bringing public sector practices into partnership making it ineffective) (Frantzeskaki et al., 2014).

In conclusion, collaboration and partnership are the governance factors that influence the urban development most. They influence the type of synergy that can be created.

4.2 Governance in Smart City implementation

Research Question: Which governance factors influence Smart City implementation?

Studies show different concepts of the Smart City, while nearly each study identifies the importance of governance for a Smart City in various contexts. By analysing a number of research statements on the term 'governance' in Smart City initiatives I try to determine the most relevant sub-processes for the governance process. What is meant by the term 'governance' in Smart City literature and how does that fit my definition of 'governance' in the context of urban development?

Meijer & Bolivar (2015) has recently reported about a comprehensive literature analysis on the Smart City concept and the meaning of 'smart governance'. They found three types of idea-typical definitions for Smart Cities, one of which has a governance focus, seeing Smart Cities as cities with Smart Collaboration:

> The publications with a governance focus highlight the interactions between various stakeholders in the city in their definition as the defining feature of a smart city. Smart cities are seen from a user-centred perspective with more emphasis on citizens and other stakeholders. . . This perspective highlights the importance of connecting knowledge centres to the action perspectives of various actors in the city to create 'innovation hubs'. The idea of collaboration is more central to this approach and authors focus on developing productive interactions between networks of urban actors (Meijer & Bolívar, 2015).

Meijer analysed the literature on Smart Cities with respect to the different views on the concept of Smart City governance. He identified four ideal-typical conceptualizations of Smart City governance: (1) government of a Smart City, (2)smart decision-making, (3) smart administration and (4) smart urban collaboration. Meijer concludes that currently researchers favor a view on governance that demand the greatest transformation of city government. "The perspective with the highest level of transformation – smart urban collaboration – is presented in most publications and this illustrates the dominance of transformational ideas in the literature on smart city governance." (P#.) He points at the potential risks of this vision: "Good administration and good policies may result in strong interactions at the urban level whereas a focus on smart collaboration may result in more attention to issues of collaboration than actually making things work" (Meijer & Bolívar, 2015). In order to determine the effect of smart governance, Meijer (2015) suggests that "In an actual analysis of smart governance, we need to analyze the level of transformation and then relate this to the level of success of the smart city" (Meijer 2015).

Another risk signalized by Meijer is the lack of attention for the political side of smart governance. He doubts the legitimacy of claims of Smart City governance.

> Although some academic publications highlight economic gains, most studies of smart cities highlight either post-material outcomes (sustainability) or a post-material process (enhanced citizen participation) as sources of government legitimacy (see Inglehart, 1971). Interestingly, neither sustainability nor citizen participation are analyzed as issues of political struggle and debate but rather as desirables for a 'good society (Meijer 2015).

According to Meijer there is a lack of attention for the political consequences of technical choices and there is too much belief in Smart City as 'a good thing for everybody'. This vision fits in with other critics on the Smart City concept pointing at the potential risks for democratic institutions.

Dameri (2013) defines governance as the crucial success factor with a definition that fits the one I defined for this thesis:

> The smart city governance is a crucial activity to grant the success of smart initiatives. Indeed, governance is the process able to address all the individual behaviours towards a common vision and goals of all the initiatives . . . The smart city vision should be built by shared processes, involving all the stakeholders, and pursuing the definition of policies and rules: the

> first ones to drive the single project towards a common goal, the latter ones to state the boundaries and scope of the projects and rights and duties of all the actors (Dameri, 2013).

Giffinger & Gudruns' use a model to rank European mid-sized Smart Cities views smart governance as a core of Smart Cities. In their model smart governance (participation) represents participation in decision-making, public and social services, citizen participation, transparent processes and political strategies & perspectives (Giffinger & Gudrun, 2010).

Alawadhi et al. (2012) in 'Building understanding of Smart City initiatives', used interviews to qualitatively understand concepts and factors that characterize smart city initiatives. This research is clearly based on the Smart City framework of Chourabi et al. (2012), including the same eight influencing factors. They find governance as a very wide field, in which it encompasses "programmatic directions, budgetary and resource allocations, the interactions with external actors as well as internal partnerships with other departments and agencies" (Alawadhi et al., 2012). Furthermore they found "Interviewees also see governance as stakeholder engagement" (Alawadhi et al., 2012). In literature they identified stakeholder relations as one of critical governance factors to determine success and failure of e-government projects. These 'Stakeholder relations' includes the ability to cooperate among stakeholders, support of leadership, structure of alliances and working under different jurisdictions: "While different models represent internal (within government) governance, governance also means the interaction with external actors. Smart City initiatives often entail intersectoral as well as interagency collaboration" (Alawadhi et al., 2012). In this research they also state case study smart governance promotes collaboration, data exchange, service integration and communication. This analysis show there is a thin line between stakeholder participation, partnership and collaboration.

Nam and Pardo (2011) propose a number of sub factors of governance: "the need for system interoperability, integration of systems and infrastructures, cross organizational management and managerial interoperability, leadership, policy integration, marketing, collaboration, partnership and consideration of the context" (Nam and Pardo, 2011). In previous publications, however, finer detail on how to deal with, or implement these sub-success factors is lacking.

Ojo (2014) distinguishes four types of governance actions that relate partially to the eight sub-factors from Chourabi. Seeing governance as a mechanism for actions: 1) Coordination and integration; 2) service integration; 3) Participation and co-production; and 4) policy and regulations. In detail:

> Coordination and integration actions in smart city programs include identification of an agreed set of projects by stakeholders across sectors, use of administrative and legal instruments for conformance, and integrated planning practices involving multiple sectors. Service approaches integrated utility management with the use of Urban Operating Systems (UOS) for managing urban services. Participation and co-production actions include building multi-stakeholders partnerships with industry, academia, and residents in addition to the participation of internal firms in the development of smart cities. Lastly, policy and regulatory actions include master-planning, institutional development, certification of practices (e.g. buildings), promotional activities (e.g. low carbon growth), and development of framework acts (Ojo et al., 2014).

Based on the Smart City framework by Chourabi et al. (2012), eight factors (sub-categories) which make up the main category 'governance' in this thesis are:

Collaboration, leadership and champion, participation and partnership, communication, data-exchange, service and application integration, accountability, and transparency.

In paragraph 4.3 'Understanding Smart City Governance' I will point out my interpretation of these sub-categories on both the barriers and success factors regarding the findings from literature on Smart City implementation.

Governance maturity levels

An example of a way to analyse (measure) the governance performance of specific Smart City initiatives is given by Lee and Hancock. They use a framework in which the governance aspect is subdivided in six factors to analyse three cases: Amsterdam, Seoul, and San Francisco. These six factors contain the following: Smart City Leadership, Smart City Strategy, Dedicated Organization, Smart City Development/Management Processes, Performance Measurement, and Smart City Principles. They formulate four levels of maturity (scale factors: 1, 3, 5, 7), thus building up a matrix of 24 cells to be used as an analysis framework for Smart City governance Maturity Level (J.-H. Lee & M. G. Hancock, 2012).

This table states that the highest form of governance is in place when a city includes 1) Strong centralized leadership with a CIO and clear roles and responsibilities; 2) Formalized top-down strategy; 3) A dedicated team with divers roles and skills, well established within the organization; 4) Well-established and clearly defined formalized processes for different types of Smart City projects; 5) widely used and publicly announced performance updates; 6) Principles based on municipal ordinance widely used by Smart City team & other divisions.

Scale Factor	1	3	5	7
Smart City Leadership	No leadership engagement & no interest in Smart City Initiatives	Smart City leadership involved on a case-by-case basis in decentralized way	Centralized Smart City leadership exists under CIO (within IT dept)	Strong centralized Smart City leadership exists & CIO's R&R are clear
Smart City Strategy Formulation	Services develop in decentralized way in absence of Smart City strategy	Integrated/centralized smart city strategy exists based on a bottom-up approach	Top-down smart city strategy is aligned with city's specific strategic initiatives	Formalized top-down smart city strategy revised on a regular basis according to a comprehensive strategic perspective (AS-IS/TO-BE)
Dedicated Organization	Functions exist in IS division or elsewhere within the city hall, but no dedicated team for Smart City has formed	Independent dedicated small team of working (coordinating) closely with others city teams	Dedicated smart city team has diverse roles yet not established within organization	Dedicated team has diverse roles & skills & is well established within organization
Smart City Development/ Management Processes	No standard processes; each agency takes decentralized approach in developing & managing smart city projects	Smart city processes follow conventional IT development/management processes, which are centralized	Formalized smart city processes exist but not in detail (i.e. are at an early stage) & not yet recognized by related agencies	Formalized processes for different types of smart city projects are clearly defined and well established within the organization
Performance Measurement	No performance indicators for smart city development	Indicators use IS performance indicators or partly exist in other form	Smart City PMS is uniquely developed, but only used internally by Smart City team	Smart City PMS updates regularly and widely used and publicly announced
Smart City Principles based on municipal ordinance	Absence of principles for Smart City planning /development / management, inc. R&R	Smart City principles limited to certain divisions	Smart City Principles as utilized by Smart City team based on municipal ordinance; principles not used by other divisions	Smart City Principles based on municipal ordinance widely used by Smart City team & other divisions

Fig. 3.1 Smart City Governance Maturity Level (J.-H. Lee & M. G. Hancock, 2012)

This approach to governance is much more restricted as in most other studies and theories. Their study analysis leads to the three - in my opinion rather general, but relevant - recommendations concerning governance: 1) Defining smart city visions & road-mapping a comprehensive smart city strategy for continued leadership (clear role & responsibility); 2) Integrating planning/development/management processes & principles for smart city initiatives; 3) Creating smart city eco-system for innovation & entrepreneurship through different types of private-public partnership (e.g. special purpose company).

Summary

The above summarized research on governance aspects is combined in the table below to compare the different conceptualisations of governance. This shows the different governance factors influencing Smart City implemenation.

Chourabi et al. (2012):	**Ojo et al., 2014:**	**Ojo et al., 2015**	**Nam & Pardo, 2011**	**Lee, 2012:**
Collaboration	Coordination and integration	Interoperation among network of cities by sharing tools and methods	Collaboration; cooperation	Strategy formulation
Leadership & champion				Leadership
Participation & partnership	Participation and co-production	Co-created services Enabling open innovation Open engagement of citizens in policies	Partnership; Citizen engagement and participation	Dedicated organization
Communication		Better information sharing across local authorities through data standards;		
Data exchange		Improved capacities of citizens & stakeholders to leverage open data.		
Service & application integration	Service integration	Improved services across major sectors like transportation and public safety.		
Accountability		Significant improvement in internal decision-making.		Performance measurement
Transparency		Enhanced transparency		
Other	Policy and regulations			Development management processes.Principles based on municipal ordinance.

Table 3.1 Summary Smart City governance factors

The different frameworks are partly overlapping, also due to collaboration between academic authors. I conclude that collaboration and partnership are part of every approach to governance. Compared to Chourabi et al .(2012) Ojo et al. (2014) treat 'Partnerships' as another mechanism, apart from governance. At the other hand they see Policy and regulations as a sub factor from Governance, while Chourabi addresses Policy as an independent core factor of each initiative. Chourabi et al. (2012) offer the most complete set of sub factors for governance and I will use this set for further analysis.

4.3 Understanding Smart City Governance Processes

Research Question: How can the governance sub-aspects be defined and how are they related and what are the success factors and barriers related to these eight governance sub-factors?

In this chapter the influencing factor 'Governance' is analysed by describing the different constituent sub-factors from Chourabi et al. (2012), summarizing notions from the academic literature since they do not offer clear descriptions of the factors they have distinguished.

The objective of this description is to gain insight in the different aspects of governance and to establish a basis for analysis of the governance in specific cases. Chourabi et al. (2012) defines eight factors as aspects of governance in a Smart City:

1. Collaboration
2. Leadership and champion
3. Participation and partnership
4. Communication
5. Data-exchange
6. Service and application integration
7. Accountability
8. Transparency

Solely looking at the terms chosen for these aspects suggests that the first six (collaboration until integration) are seen as activities, so they fit well to the chosen definition for governance as a set of processes, while 7 and 8 are formulated as properties. These properties seem to be founded from the generally used meaning of governance as set of rules to improve management within a specific organization. The main domain for these criteria is the decision making process which is not identified by Chourabi et al. as a separate governance process, so we assume it is a sub-process of different processes like collaboration, partnership and leadership. Within the governance of a joined initiative all kind of actions will be necessary to acquire the needed accountability and transparency levels. So, although they might be defined as criteria, we can also view them as the governance processes necessary to meet those criteria.

4.4 Governance sub-processes

In the next pages I will give a description of each sub-process of governance based on notions from the research literature. Elements from the literature are presented in green if it concerns a success factor and in red if it concerns a barrier. For each sub-process a short resume is given as a characteristic of that sub-process. An overview of the found success factors (marked +) and barriers (marked -) is presented in a schematic summary related to the main questions: Why? (The objectives of the process), Who? (The performers of the actions) and How? (What conditions contribute to success or failure?).

4.4.1 Collaboration

The sub-process 'collaboration' has the function to establish and maintain the collaboration between the stakeholders to optimize partnership and participation. Collaboration is an activity of all stakeholders and will depend on their ambition and the roles they individually fulfil.

Since Smart City initiatives are citywide movements, stakeholders of the initiatives include various actors such as governments in other jurisdictions, non-profits, companies, schools, universities, and individual citizens. According to (Mora, 2015) "collaboration between stakeholders and organizations across multiple sectors is critical".

Collaboration is about working together between government departments and services mutually and between them and private parties. "Smart City initiatives require interdepartmental

collaboration and cooperation through sharing information, resources, and sometimes authorities. Interviewees recognize interdepartmental and inter-organizational meetings as essential to proceeding smart city initiatives" (Alawadhi et al., 2012). "Successful cities possess a set of common features [29]. One characteristic is collaboration among different functional sectors and parties (government, business, academics, non-profit and voluntary organizations, and others), and among different jurisdictions within a given geographical region" (Nam & Pardo, 2011a).

Ojo (2014) finds a success factor is to "Collaborate with a range of partners who share the vision and commitment." And requires for "regulations and standards for stakeholders" (Ojo et al., 2014).

Collaboration is often demanding for new ways to formalize the joined efforts. Peek (2013) clearly sees collaboration as a critical factor in the implementation process, however does not further elaborate on when, and how these collaborations should come into existence, or why this is necessary. "Urban development can flourish within the Smart City when government and market parties can be breed into new supply chain collaboration. Only then, the Smart City will be a successful impulse towards urban development" (Peek, 2013). Input for a good collaboration process is clear roles agreed upon between the different stakeholders. Falconer and Mitchell (2012), state "Stakeholder roles must be established prior to developing any Smart City plan because these players have the most influence on city initiatives and operations" (Falconer & Mitchell, 2012).

Collaboration is often formalized in specific organizational forms like steering committees or Public Private Partnerships, which have many alternatives. Lee et al.'s (2012) study finds:

> …there are multiple ways towards collaboration, each city chooses its own path. It has been important for some cities to establish formal committees overseeing cooperation within their organization. Other cities have founded dedicated organizations to support smart technological developments in terms of planning, management and rollout. Some new cities have opted for SPCs (Special Purpose Companies) to attract private sector funds, expertise and other involvement in developing a smart city (J.-H. Lee & M. G. Hancock, 2012).

Collaboration is about working together within a specific area, but also on a meta-level of working together with other cities to exchange expertise, knowledge and best practices, often stimulated by higher level government like in the UK or EU:

> The creation of a central office that acts as go-between for Smart City ideas and initiatives, drawing in diverse stakeholders, is of vital importance and allows coordination of ideas, projects, stakeholders and beneficiaries. Local level coordination can be important for uptake, to ensure the integration of solutions across the portfolio of initiatives […] It is important for cities to participate in networks to share knowledge and experiences, therefore promoting their own initiatives as well as learning from others and laying the foundations for future collaboration (European Union, 2014).

Angelidou (2016) states in a recent comparative case study that this collaboration across cities is typical a characteristic of Smart Cities. "Collaboration and networking, referring to partnerships with other cities for knowledge and experience exchange and examining complementarities in strengths and weaknesses, is a basic horizontal characteristic of smart cities" (p). She adds to this that large cities, like in her analysis Amsterdam, Barcelona, London and Stockholm, have a strong competitive advantage:

> Large and established cities, such as the ones studied in this paper, are in privileged position, as they are already experienced in international networking and are members of various networks and city alliances that they can leverage. Special attention should be paid to promote the digital presence of the city (website, social media). Such promotion will

underpin efforts towards becoming smart and engaging stakeholders in this process (Angelidou, 2016).

The set of collaborating parties differ from city to city and also between initiatives. Lee finds for example in a comparative study for Seoul and San Francisco that they "have adopted different forms of (public and private) partnership. Amsterdam has set up a special purpose entity [Amsterdam Smart City] to promote it's the smart green city."(Lee, 2012).

In an interview with Kees Jansen (2016), smart city strategist, we talked about governance success factors and barriers in Smart City initiative implementation. Jansen divides the Smart City in three layers: the city, the technology and the citizens, in which the playing field is defined by decision-makers, users, and developers. In this environment actor roles are constantly shifting. He is convinced that the main characteristics for successful governance relate to strong collaboration, in which (local) public authorities, private companies and local communities (mainly entrepreneurial individuals) show leadership by initiating ideas, sharing commitment and data, creating innovative solutions together. According to Jansen the key to good governance is stimulating synergy between different actors, and creating informal partnerships in which actors from all fields can join forces. This synergy can be driven by the local governance by creating regulation-'free' areas as smart 'living' labs (Interview Kees Jansen, may 2016).

Summarizing the characteristics for the process of collaboration:

- Stimulus for and stimulated by 'partnership and participation';
- Sharing information, resources and authorities with a crucial role for open data;
- Collaboration as 'smart governance' can also be an objective of an initiative;
- Having agreed regulations and standards for the stakeholders, including their specific roles;
- Based on a shared vision and commitment to realize this vision;
- Materialized in specific forms like PPP or SPV, meeting structures, or multiple helix collaboration;
- Not limited to the Smart City initiative but also operating on a meta-level between other cities and organizations.

Fig. 4.1 Overview success factors and barriers Collaboration

4.4.2 Leadership and champion

‘Leadership and champion’ is referring to one or more essential roles within the collaboration. Giving leadership is the task and process to fulfil this role. The more complex the founding stakeholders, the more essential this leadership role will be, to build and secure all necessary ‘bridges’ between the parties. “Leadership of key leaders and their strong support (championing) of the smart city vision are fundamental to the success of smart city […]. The role of leadership is pivotal both within government and for its relation with citizens” (Nam & Pardo, 2011a).

‘Leadership and champion’ is on the border of the influencing factors Governance and Management & organization. This is for example distracted from the way it is handled by Chourabi et al. (2012) in their respective publications; first as part of Governance, later as part of Management & organization/Policy. In complex situations like Smart City initiatives leadership is needed on all levels (strategic, tactical and operational). The governance part of leadership is assumed to have a more strategic focus.

“the presence of leadership is important for good governance . . . the presence of a ‘champion’ that collaborates with all stakeholders as an essential factor for good governance” (Chourabi et al., 2012). But what kind of leadership or champion are we talking about? Alawadhi summarizes the results of interviews on this subject distinguishing top-management, the mayor and the mayor’s political position as relevant leadership elements:

- Managers interviewed commonly stressed the role of the top management in envisioning a smart city and championing smart city initiatives. The executive support facilitates citywide and organizational commitment to the initiatives. Many interviewees also emphasized political support from elected officials.
- Quite a few interviewees talked about policy directions made by the mayor or the city manager, respectively. Along with his or her strong support and championing of smart city initiatives, the mayor’s policy directions shape the city’s overall strategies to make it smarter.
- The mayor’s political position also impacts policy directions that outline smart city Initiatives. In one city, the mayor’s administrative leadership does not belong to any political affiliation (independent). In other cities, the mayor’s political affiliation may be one of the reasons for strong support for government-driven smart city initiatives from the public and groups (Alawadhi et al., 2012).

According to Ojo et al. (2014), based on research from 10 Global Smart City initiatives, Political leadership stands out as one of the two critical success factors for Smart City programs. A similar, but more explanatory statement is made by the UK government:

> Developing a vision, displaying leadership and public engagement are underlying success factors, as well as commitment from the top to drive through change and innovation to achieve quantifiable objectives. This can materialize in the form of a group of people within the organization who are able to innovate and act entrepreneurially, to play an active role in seeking out new opportunities. These organizations must have strong political support [mayor’s office/executive team] and clear mandate, for credibility and focus on innovation. Success depends upon building credibility and trust with their internal clients (Government, 2013). A vision underlined by (Arup, 2013) to ensure the longevity and sustainability of the Smart City programme.

The need for leadership and political support is also substantiated by research for the EU: “If the initiative is launched by the mayor of the city and leading representatives, as well as by CEO’s of local enterprises, this increases the credibility of the initiative” (European Union, 2014).

In line with this political leadership, Simon Giles (partner at Accenture and global lead for Smart Technology Strategy), pointed out that it is crucial "to identify clear inflection points or focal points, preferably at the beginning of the political cycle, to build momentum for smart city strategic engagement" (Anderson, 2011).

Without clear leadership, John Jung, says in the article 'Smart Cities – How to move differently': "Big cities tend to sit on their hands a lot. They debate, they investigate, studies are done and nothing happens. This is where attitude comes in. You have to have a champion and you have to keep things moving." To Jung, it doesn't matter who leads the transition to a Smart City, although he agrees that without the right attitude in the local authority it would be a hard transition to make, saying: "Certainly, you need a sense of good governance or a willingness of governance to work with the community"(Jung, 2015).

This governance factor 'Leadership' is getting more and more attention. In June 2016, during the yearly Amsterdam Smart City Event, a Conference was held on 'Urban Leadership' in which digital transformation and up-scaling of smart cities was a key theme. The organizers stated that the role and importance of Urban Leadership can hardly be underestimated. A new form of leadership (business executives, education luminaries and public entrepreneurs) is required to boost a city's capabilities and organizing capacities to design and execute innovative strategies for sustainable competitiveness. This shows new leadership roles are still being discussed and discovered.

In 2016, a report entitled 'Enabling sustainable city competitiveness through distributed urban leadership', was published by the European Institute for Comparative Urban Research (Euricur) and PwC. The report focuses on the evolving challenges of urban leadership in the 21st century and contains ten case studies from cities around the world. It concludes about leadership as a core success factor relating it to some of the other governance sub-processes:

> Leadership lies at the heart of enabling and delivering sustainable urban competitiveness and is critical to place-based strategy development and implementation. It is also increasingly shifting from being in the sole hands of strong individual public sector leaders towards a more collaborative approach with leadership distributed across lead firms, knowledge institutes and engaged citizens as well (PwC, 2016).

Summarizing we find the next characteristics for the process of (political) leadership and champion:

- Interacting on the process of collaboration by giving guidance;
- Envisioning the objectives;
- Relating citizens to the initiative;
- Facilitating government commitment;
- Support strategic alignment;
- Giving policy directions;
- Reaching all stakeholders;
- Building credibility and trust;
- Create an attitude towards real action.

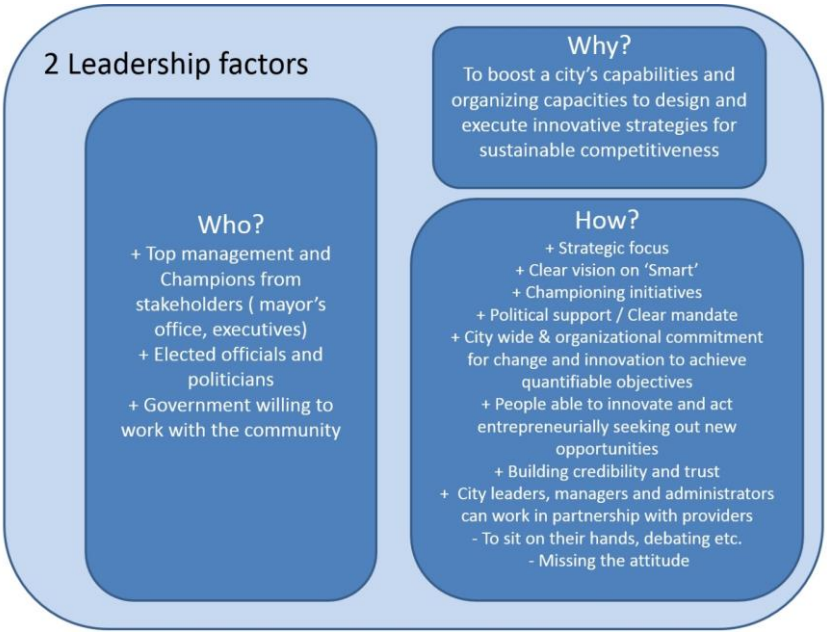


Fig. 4.2 Overview success factors and barriers Leadership & Champion

4.4.3 Participation and partnership

'Participation and partnership' refers to the way and degree in which parties are involved in the collaboration. Partnership refers to any (legal) form in which legal entities like government organizations, institutions and private companies shape their cooperation. Participation refers to the hoped for influence of citizens as non-legal entities. The formalization of the commitment of partners and participants can have different formats.

Participation

The study 'Mapping the Smart Cities in the EU' makes clear that inclusion and participation are not only means but also important targets for Successful Smart City programs, to avoid polarization between the urban elite and low income areas. This study highlights "Citizens should be empowered through active participation to create a sense of ownership and commitment, and it is important to foster participative environments that facilitate and stimulate business, the public sector and citizens to contribute [to Smart City development]" (European Union, 2014).

The main objective of participation is to ensure that an initiative has the focus on solving the most important problems with solutions that will be generally positively valued by the involved community (represented by some of its members). So participation has to do with prioritizing and the creation of real added value as a sound basis for acceptance of the created solutions. Participation can be materialized in very different formats like 'Living Labs', 'lighthouse areas', 'Urban Transition Labs', 'Innovation Districts' etc.

In 'Smart Cities Governance: The need for a Holistic Approach to Assessing Urban Participatory Policy making', the central role of citizens in the decision-making process and their fundamental contribution to public value creation in the city context is reaffirmed. This central role for citizens is their most innovative element. "Citizen engagement is not just a way to stimulate participation in the public debate, but as a process of social innovation that allows citizens to coproduce public value" (Castelnovo, Misuraca, & Savoldelli, 2015).

Dameri states that participation is very dependent on the digital awareness of citizens, linking it to e-government initiatives:

> It [participation] requires the active role of citizens in participating to the city governance and to exercise a democratic role in the city choices. It is strictly related to the e-government initiatives and it depends . . . on the presence of public e-services and on the digital awareness and culture of the city population" (Dameri, 2013).

Dameri stresses the relation between the two sub-processes 'participation' and 'communication': "Citizens should even be involved, both in the plan phase and . . . implementation steps; communication is at the centre of a shared participation in defining smart city goals and in spreading awareness about the smart city role and benefits for people" (Dameri & Rosenthal-Sabroux, 2014).

Alawadhi et al. (2012) find a growing awareness of the importance of participation for Smart City implementation. "Smart city initiatives welcome residents to participate in the governance and management of a city" (p). Therefore "governments increasingly pay attention to citizen participation in decision making, monitoring city services, and providing feedback" (Alawadhi et al., 2012).

The term 'citizen participation' suggests somehow it being the wish or favour of an existing power acting as the origin and force to regulate the participation. Citizens are invited 'to join the game', but according to Capra (2014) it could go a lot further:

> The typologies of citizen participation described so far share the feature of not being originated by citizens themselves. Hence, they can be considered as top-down forms of citizen participation, where either public or private decision-makers take the initiative. However, citizen participation in urban development is not limited to the aforementioned typologies, a further category of citizen participation involves the citizens as initiators (Capra, 2014).

Capra (2014) determined different levels of citizen participation, ranging from low towards having high influence on decision making: "provision of information to citizens, consultation of citizens, existence of partnerships with citizens, control by citizens over decisions or presence of socially innovative practices" (Capra, 2014, p.28).

Capra (2014) is seeying citizen participation as a result of governance and unlike Chourabi et al. (2012) as a constituting element of governance. He finds that mainly the adoption of ex-post satisfaction criteria to assess projects outcomes is a governance characteristic that contributes to a large extent to citizen participation:

> Large and complex projects are characterized by clear ex-ante set goals. Projects with governance models that include preliminary goal setting leave less room for the flexibility required by stronger citizen participation. On the other side, projects which governance permits readjustments of goals are characterized by partnership or socially innovative typologies of citizen participation (Capra, 2014).

In an interview with Jansen (2016) he mentions the drive of local individuals and companies as the prime example of participation, and underlines many Smart City initiatives thrive due to innovative local leadership: "In the City of Utrecht in the area Lombok, batteries of electrical cars are being used as energy plants to collect and redistribute energy from solar panels. This project started with collaboration between local citizens, schools, and local companies and of course the municipality".

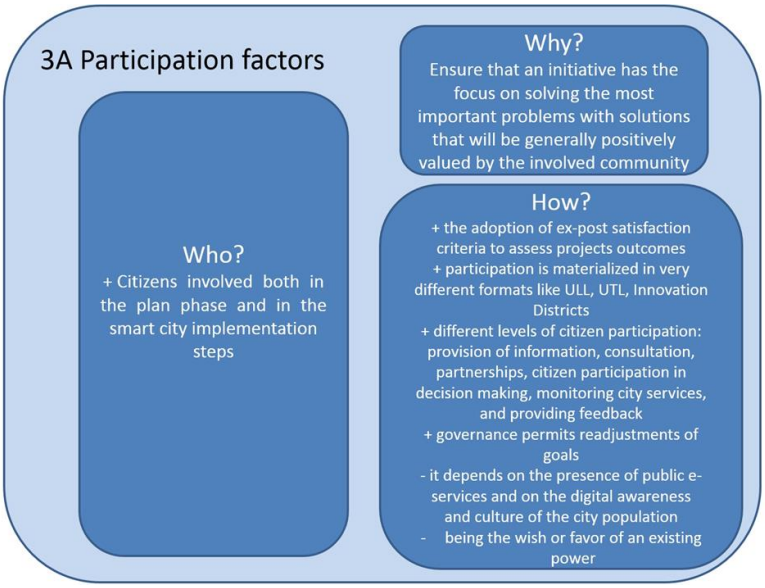


Fig. 4.3 Overview success factors and barriers Participation

Partnership

The effectiveness of urban partnerships, which is important for urban governance more generally, is influenced by many factors, such as the role of political leadership:

Anderson, global low-carbon ICT project manager at the Climate Group, wrote in an article 'Power and "politics in Smart Cities' for the Guardian, that "A smart city is one in which the actors – city leaders, managers and administrators can work in partnership with providers to leverage political power to maximise winners, minimise potential losers and remove organisational and institutional barriers to the achievement of the Smart City vision" (Anderson, 2011).

Partnership has for example been defined as "a coalition of interests drawn from more than one sector in order to prepare and oversee an agreed strategy for the regeneration of a defined area" (Elander, 2002).

Ojo et al. (2014) conclude that government entities are crucial to establish a partnership: "Smart City programs are complex and involve a wide range of partners and stakeholders playing different roles . . . While some smart city programs are driven by private sector, government entities always play a pivotal role" (Ojo et al., 2014). Therefore it is necessary to have "a strong local government partner as a key strategic player and [or] co-founder" (European Union, 2014). Nam & Pardo (2011) stress the importance of partnership to create the needed synergy to find solutions for specific problems:

> Successful innovation is oftentimes made by involvement of key stakeholders […]. Successful initiatives are the result by a coalition of business, education, government and individual citizens […]. A successful smart city can be built from top down or bottom up approaches, but active involvement from every sector of the community is essential. United efforts create synergy, which allows individual projects to build upon each other for faster progress (Nam & Pardo, 2011a)

A limiting factor for innovation is the fact that city management is focused on eliminating and avoiding risks, to assure continuity and quality of the services:

> Risk taking through experimentation is likely to be institutionally blocked in government. Public sector e-services has a legacy of a risk-averse environment where the focus is on the

politically charged short-term delivery of goals and results, lacking a long-term strategy of service innovation (Nam & Pardo, 2011b).

Besides erasing barriers between governmental departments it is also necessary to create a better understanding between the public and private sector. "The private sector does not comprehend how its technologies fit into this complex environment because it tends to view cities as just physical structures upon which to add ICT. Nor does it understand which city stakeholder . . . is responsible for which solution" (Falconer & Mitchell, 2012).

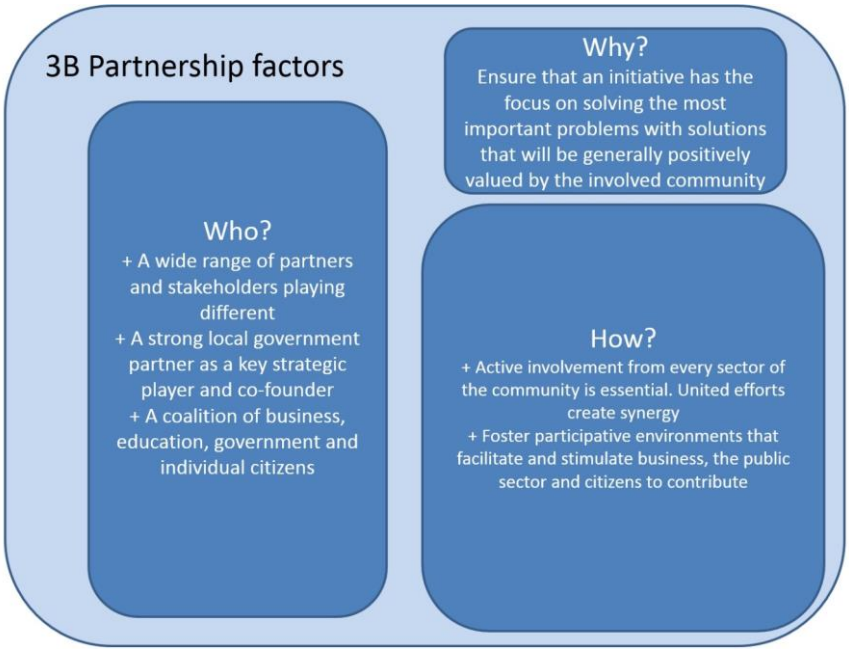


Fig. 4.4 Overview success factors and barriers Partnership

Summarizing, the characteristics for the process of 'participation and partnership' are:

Participation	**Partnership**
- Active role of citizens (and local) companies	- Build a coalition of interest
- different levels of influence on decision making	- With a strong local government partner as a key player
- Prioritizing, testing, valuing and accepting solutions and services	- To prepare and execute a strategy
- To avoid polarization	- To realize successful innovations
- To create ownership	- By creating synergies and foster progress

Table 4.1 characteristics participation versus partnership

4.4.4 Communication

'Communication' is the process of exchanging information about all aspects of an initiative at the right moment with the right target groups. Communication serves, of course, many objectives but

the main objective is to build and maintain trust, credibility and commitment between the stakeholders mutually and between their initiative and the context. Communication is an activity for all stakeholders but intensely related to the activities from the leadership and champion. "The role of communication and interaction is central to managing and organizing smart city initiatives" (Alawadhi, 2012 #1115).

Good communication is essential for a Smart City initiative, as it is for any change management activity: "Success will come from combining public governance, people ownership and business collaboration, driving communication between these groups by giving each of them a true stake in the smart city built out of their community" (Aoun, 2013). From a more top down perspective: "City government should share concepts (promotional identity and brand), visions, goals, priorities, and even strategic plans of smart city with the public and stakeholders" (Nam & Pardo, 2011a).

Nam and Pardo (2011) discuss various levels of interaction in Smart City initiatives, and they put the focus on the interaction aspects of communication, because the main process 'collaboration' can only function based on interactive communication:

> Activities for interaction can be sharing, communication or integration. Various possible combinations create the varying extent of complexity . . . Success in smart city innovation requires the ability to understand the level and nature of the complexity. (Nam & Pardo, 2011b)

In large scale initiatives the focus of communication is often on large campaigns to spread the message and manage expectations. But as a part of 'governance' there should be a focus on the interaction aspects of communication: "Face-to-face contacts between people remain of crucial importance. The proximity of people is still a necessary condition for intensive communication and exchange of knowledge" (Nam & Pardo, 2011a).

Improving communication can also be one of the objectives of a Smart City initiative. "Smart city initiatives develop information and communication infrastructures, and in turn those infrastructures promote smart city initiatives"(Alawadhi et al., 2012). In doing so, ICT-based communication infrastructures can be very helpful in supporting the communication process.

Summarizing I found the next characteristics for the communication process:

- Exchange information on all aspects between all stakeholders;
- Based on target groups;
- To build and maintain trust, credibility and commitment;
- A core task for leadership and championship to enlarge their impact;
- Essentially interactive to collect feedback;
- Improving infrastructures can be an objective of some initiatives leading to more effective communication.

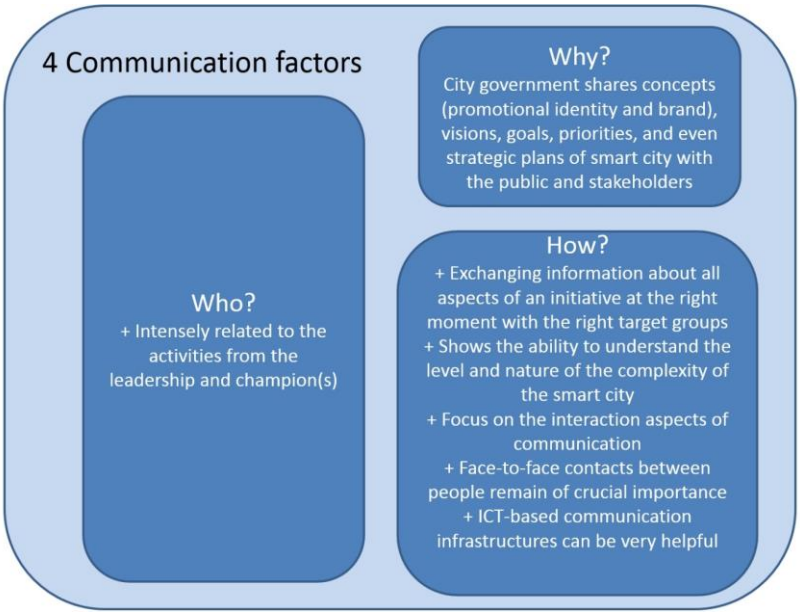


Fig. 4.5 Overview success factors and barriers Communication

4.4.5 Data-exchange

'Data exchange' is a relevant sub-process in most Smart City initiatives because the effectiveness of innovative ICT-solutions is very depending on the ability to process data and deliver information. Relevant issues concerning this data exchange are the ownership of the data, the willingness to share the data, the availability of required data and the possibility to use data from different sources. The possible advantages of data exchange are often reduced by differences in attitude between the stakeholders and conceptual and technical limitations making it almost impossible to combine data from different sources without additional investments in the underlying data-infrastructure.

Sharing data is an important base for establishing and maintaining collaboration: "In the area of collaboration, the open data initiatives were designed to enable collaboration between city and stakeholders . . . The open data initiatives were also designed to enable collaboration among different smart cities initiatives"(Ojo et al., 2015). He finds different levels of data sharing "Data exchange objectives of the initiatives include enabling data sharing among city authorities and network of cities. It also includes the exchange of data between sensor data infrastructure providers and city management" (Ojo et al., 2015). The use of open data, a form of data-exchange, in a number of Smart City initiatives has shown positive influence on governance aspects, like:

1) Better information sharing across local authorities through data standards;
2) Improved services across major sectors like transportation and public safety;
3) Enhanced transparency;
4) Co-created services that better addresses citizen and business needs;
5) Enabling open innovation in City Administration involving third-party developers;
6) Enhanced interoperation among network of cities by sharing tools and methods (standardization);
7) Improved capacities of citizens and stakeholders to leverage open data;
8) Open engagement of citizens in policies;
9) Significant improvement in internal decision-making (Ojo et al., 2015).

Publication of data in the form of 'open data' can not only enlarge the public influence on delivering smart services and solutions, it can also, according to Alawadhi et al. (2012), contribute to a more open culture and enlarge the public involvement in city management, resulting in an improved knowledge infrastructure: "Data and information is key to the cultural change. Public management is

increasingly being driven by data and information. Public managers' decision making is informed by more accurate data that smart city initiatives provide. In addition, more data and information can open governmental internal processes to the public" (Alawadhi et al., 2012).

Open data is seen by many, among which Meijer (2015) and the European Union (2014), as a chance to overcome the growing barriers between public and politics and to re-assure public involvement with city politics and improvement of the quality of services and solutions. "Open data are widely propagated as a means to strengthen the collective intelligence of cities by enabling companies, innovators, NGOs and citizens to extract value from these data" (Meijer & Bolívar, 2015). Or "in order to create useful resources for the public" (European Union, 2014).

The ideal seems not to be 'open access for everybody' Meijer & Bolívar (2015) cite different researchers pointing at the importance of clear government regulations of the possible use of data:

> Walravens (2012) indicates that governments should promote open data systems but the responsible government body should carefully consider the terms under which this data is opened up and to which actors. Similarly, Batty et al. (2012) indicate that government regulations must protect data and model development, appropriate interfaces, security of who is able or not to access the material online, questions of confidentiality, IPR (Intellectual Property Rights), privacy and so on under a smart city framework. The politics of access are clearly identifiable in these statements but they are presented as issues of managing urban intelligence (Meijer & Bolívar, 2015).

The production and exchange of data is more and more related to the use of sensors that generate relevant data. This ever growing data eruption makes clear that good policies are needed to determine what data can be made available to who at which point in time and on what level of detail or aggregation. The availability of data on an unpreceded level offers numerous possibilities to improve city management and services, it remains a question whether the potential will be generated "The hype and hope of big data is a transformation in the knowledge and governance of cities through the creation of a data deluge that seeks to provide much more sophisticated, wider-scale, finer-grained, real-time understanding and control of urbanity" (Kitchin, 2014).

In an interview with Kees Jansen (2016), Smart City Strategist, he mentions data-exchange as the cornerstone in Smart City development, "since most initiatives are services or products strongly related to data input, or data integration created by users and sensors." According to him "by improving integration among departments through an open and online database where employees or stakeholders can share information and clear communication boundaries. This increases transparency and acts against silos and slabs in the organization or collaboration".

Summarizing I found the next characteristics for the data-exchange sub-process:
- To improve effective services and solutions;
- To enlarge public influence;
- To create a more open and transparent culture;
- To create an improved knowledge infrastructure;
- To improve decision making based on a better understanding and control of urbanity;
- To learn from other objectives;
- Resulting in a rising level of surveillance and control.

The process can be facilitated or hindered by input and circumstances:
- Availability of data;
- Ownership of data can hinder publication;
- Willingness to share related to conceptual or technical limitations;

- Possibility to integrate data;
- The existence of silos and slabs;
- Regulations needed for data access and usage.

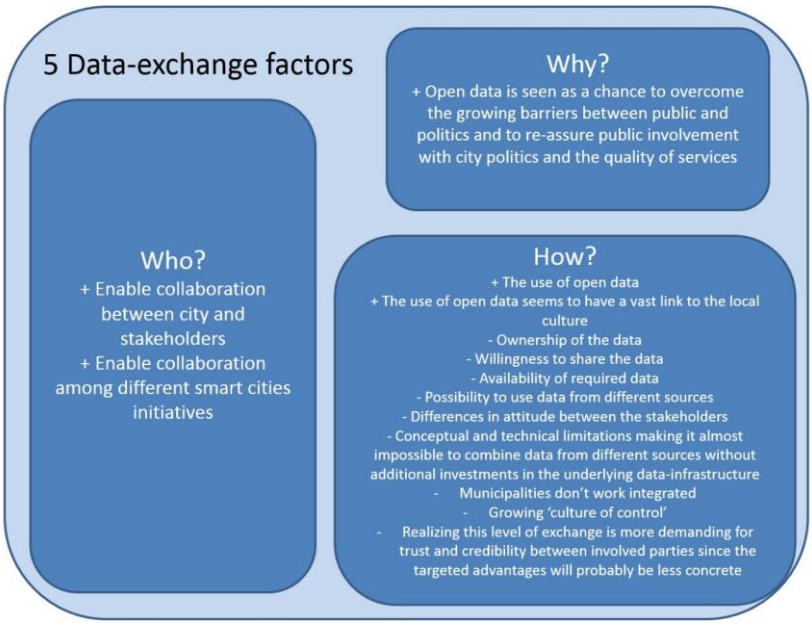


Fig. 4.6 Overview success factors and barriers Data exchange

4.4.6 Service and application integration

This aspect of governance is not explained in the original publication of Chourabi et al. Based on other publications my impression is that service and/or application integration can be an objective – 'an end' - of a certain Smart City initiative, for example to enlarge the quality of a specific service. At the other hand the integration of service and/or application can also be an intermediary - 'a mean'- to create a basis for exchange of information that enforces the collaboration between stakeholders and creates possibilities for the development of new services and added value. This integration is a core aspect of the Smart City, defined as "the use of smart computing technologies to make the critical infrastructure components and services of a city – which include city administration, education, healthcare, public safety, real estate, transportation, and utilities – more intelligent, interconnected, and efficient" (Meijer & Bolívar, 2015). Other research like Nam & Pardo (2011b) confirm the importance of these integration processes and service as a condition for further improvement:

> A smart city is not system-driven but service oriented. The ultimate goal of a smart city is to enhance the overall quality of city services. Establishing an integrative system is not an end in itself, but a mechanism through which service is delivered and information is shared. Organizational and policy innovation for a smart city is to effectively manage service and consider service demands identified through governance (Nam & Pardo, 2011b).

The need for integration is not only a result of the classic siloed organization of the government, this is, according to Anderson (2011), increased by the way industry partners have been operating on the level of insulated solutions:

> There has been a failure in the industry to look holistically at the smart city, to clearly articulate in a meaningful way a vision of how ICTs could enable a different and better life, and to bring citizens, politicians and others along on that journey. There has been a tendency

> within the sector to focus on the technology stacks and single-solution deployments in specific city departments at the expense of integrated solutions. Disaggregated management and ownership structures in cities and the siloed behaviour that characterizes them have also contributed to a perpetuation of the status quo (Anderson, 2011).

Arup noted in 2013, that to support the integration process often specific organizational measures are taken to assure that traditional barriers can be overcome:

> In order to support cross departmental working for smart cities, many cities are choosing to place the smart city vision in a department that already works horizontally across city siloes (such as the Mayor's Office). Alternatively they are adding in new groups to their organizational structure that are able to act as umbrellas for a host of existing activities. The aim of this is to ensure that all departments are working together towards an aligned vision (Arup, 2013).

The EU is an important advocate of integration activities, based on the belief that only integrated solutions will fit the complex needs of urban cities: The various dimensions of urban life . . . are interwoven and success in urban development can only be achieved through an integrated approach" (European Commission, 2014b).

According to Jennifer Belissent (2011a), the report 'Smart City Leaders Need Better Governance Tools', by Forrester highlights the possibilities for integration tools and services facilitating smart governance: "The opportunity for tech vendors and service providers lies in facilitating smart governance — offering cloud and shared services models for business applications, providing integration and cloud management services, and generally facilitating the coordination and collaboration among city departments and city leadership" (Belissent, 2011a).

Although this forecast underpins the integration process as a relevant sub process of governance, the focus on the technology has the risk of 'a solution in search of a problem'.

Summarizing I found the next characteristics for the process of integration of services and applications:

Necessary because of:

- Disaggregated ownership structures;
- Siloes in governmental organization;
- Insulated solutions from IT-suppliers;
- Complex needs;
- Risk avoiding governmental culture.

Targeted effects:

- Integrated systems;
- Improved information exchange leading to enforced collaboration between stakeholders;
- New services and improved added value of existing services;
- More effective service management.

Demands for:

- A specific organization working horizontally;
- New groups in an organization to change the culture;
- Erase the barriers between government departments;
- Better understanding between public and private parties;
- Technical tools and solutions to support.

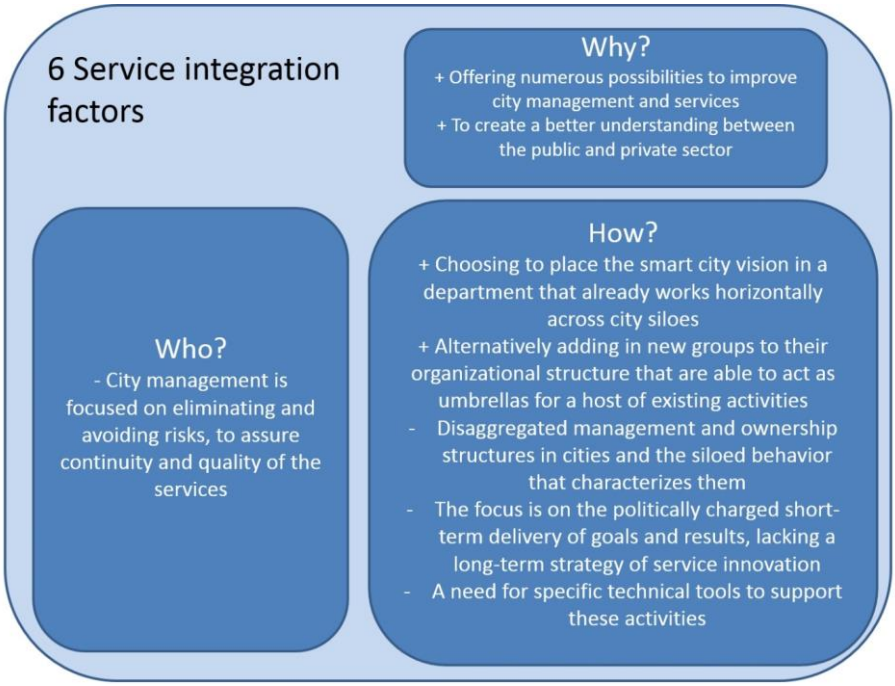


Fig. 4.7 Overview success factors and barriers Service and application integration

4.4.7 Accountability

Who is accountable for what decisions on what moment? This governance sub-process is concerned with criteria for good governance. Accountability makes clear which roles are involved in the collaboration, which stakeholder owns a specific role at a certain moment in time and what the consequences are for decision making and the use of mandates. It is a central issue in Smart City governance, as it is in any governance situation.
Accountability makes clear how responsibilities are shared by the stakeholders and more specific how they are divided between public and private sectors. It supports the process of democratic control to make clear whether objectives are met, investments are responsible and the right decisions have been made in public interest. Accountability offers the possibilities for the non-responsible parties/persons to gain insight in the process afterwards and judge the formal legitimacy and the extent to which relevant norms and procedures were respected. Accountability includes also the possibility to judge and proclaim sanctions in case rules were violated. These rules can be of different origin like for example legal, administrative, fiscal rules. Accountability can support the collaboration between the stakeholders because it helps in creating a clear division of power and influence.

In his article, Anderson stated “What is often overlooked is the importance of power politics in strategic decision-making at city level. Politics is often seen as a dirty word. When some people think of politics, they often think of corrupt governments, dirty, closed-door deals and a lack of accountability” (Anderson, 2011). This stresses accountability as a necessary condition for politics in a democratic environment.

According to Nam (2011) accountability has a negative effect on the drive to take risk and innovate in the public sector:

> Government agencies are monopolies without competitive pressure to innovate as well as bureaucracies structured to perform core tasks with stability and consistency, and resist change or disruption of those tasks. The public sector cannot easily burden varying costs of learning, experimentation and improvisation. The avoidance of failure is an organizational

priority in the public sector and is highly valued because of accountability (Nam & Pardo, 2011b).

Summarizing I found the next characteristics for accountability:
- Clear division of power, roles and responsibilities;
- Good logging of decisions and mandates;
- Facilitating democratic control on public interest;
- Setting sanctions on violating the rules;
- Stimulates risk reduction behaviour;
- Makes use of (legal) norms, rules and procedures;
- Enforces collaboration between stakeholders.

Fig. 4.8 Overview success factors and barriers Accountability

4.4.8 Transparency

Like 'accountability' this governance sub-process is concerned with a criterion for good governance. 'Transparency' is focusing on the openness of an organization, to make sure legal rules and ethical norms are valued and lived by, to avoid backroom decision making. Transparency has to assure all stakeholders that processes and especially crucial decision making is being done by agreed standards and procedures. A main objective of transparency measures is to make accountability visible to stakeholders or even to the general public.

Nam (2011) relates this interwovenness of accountability and transparency to being citizen-centric: "Smarter government 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 about decisions that affect their lives" (Nam & Pardo, 2011a).

Transparency is often formalized in rules and procedures among which evaluation is a crucial one. Evaluation is set up to judge the results and to learn from experience by describing lessons learned, but it generates often the timeframe in which accountability is formally realized if relevant criteria are met:

> Evaluation of programs is another important aspect of a successful Smart City. In general terms, the evaluation should assess whether objectives of the projects have been

accomplished and, if not, what difficulties were encountered and why. The precondition for any evaluation is that there are clear, measurable objectives and the evaluation is independent (European Union, 2014)

Transparency is realized mainly by communication and by the publication of data. The related openness is also expected to have a positive influence on citizen participation. Zanella et al. (2014) highly value the effect of available data:

> The availability of different types of data . . . may also be exploited to increase the transparency and promote the actions of the local government toward the citizens, enhance the awareness of people about the status of their city, stimulate the active participation of the citizens in the management of public administration, and also stimulate the creation of new services upon those provided by the IoT (Zanella, Bui, Castellani, Vangelista, & Zorzi, 2014).

Summarizing I found the next characteristics for transparency:
- To make accountability visible to stakeholders and sometimes even the general public;
- To create openness: decision making is done by agreed standards and procedures and verifiable;
- This openness can lead to enforced citizen participation;
- Rules and norms are lived by and backroom decisions are avoided;
- Makes operations more citizen centric.

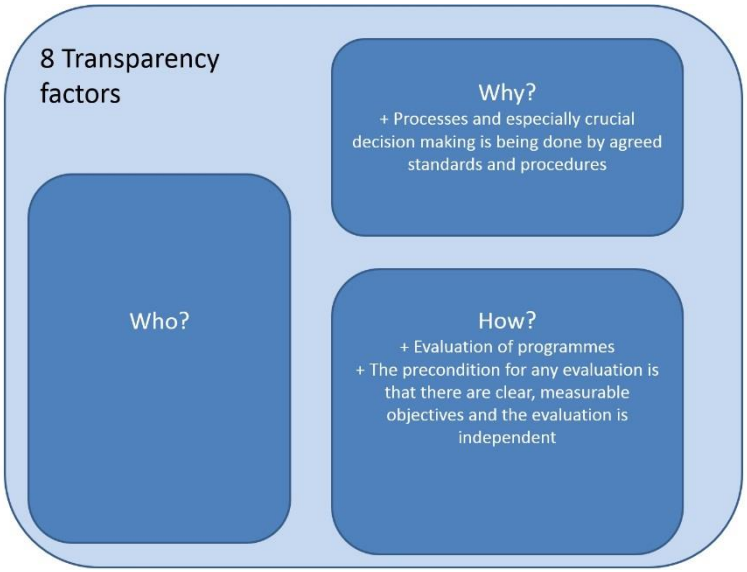


Fig. 4.9 Overview success factors and barriers Transparency

4.4.9 Governance sub-process definitions

Based on the above described characteristics per sub-process the following definitions for these sub processes are formulated as an answer to the research question:

Collaboration, the core process of governance, contains all kind of activities developed by the stakeholders to realize a shared vision and objectives (product oriented) and to improve the ways of working together (process oriented).

Leadership and champion, the process and roles to give guidance to the collaboration, create credibility and trust, bind the stakeholders to targeted results and overcome barriers to maintain an action oriented mode.

Participation and partnership, processes to create and maintain participation of citizens and partnership between public and private institutions to guarantee optimal involvement of the stakeholders.

Communication, a process with many different activities to support and optimize the collaboration between the stakeholders and to exchange information with individuals and organization in the given context to support mutual alignment by sharing data, knowledge, ideas etc. and to collect feedback by interaction.

Data-exchange, a collaboration process supported by communication to make data available to different stakeholders (and sometimes even unidentified parties) to improve products and services and/or the collaboration process itself.

Service and application integration, the process of improvement of solutions for specific problems by combining services and/or applications and data from different developers and/or different clients.

Accountability, the process of defining and applying specific roles, responsibilities and measures within an organization to make clear who is responsible for which results and activities.

Transparency, the process of defining and monitoring clearness about decision making processes based on the defined accountability.

During an interview Jansen approved of all these definitions of the different governance factors, in which “Collaboration and leadership are key drivers in achieving smartness, and communication, accountability, transparency, integration and especially data-exchange are criteria for successful implementation of Smart City initiatives.” He emphasizes the role of the government in providing playgrounds for experimentation, but is biased on subsidized Smart City projects. A nuance he adds to the governance definition is that “it is not only important to strive for shared goals, but also to achieve individual goals.” (Interview Kees Jansen, Smart City strategist, .. may 2016)

The definitions include statements about the relations between the different sub-processes of Governance. The core process seems to be ‘collaboration’ heavily supported by ‘communication’. ‘Partnership and participation’ and ‘leadership and champion’ can be seen as sub-processes of the collaboration process. Although Chourabi (2012) presents ‘Partnership and participation’ as one combined factor, the analysis points out that there are so many differences in the processes concerning the different stakeholder groups, that a separate representation is justified. ’Open data’ and ‘Service and application integration’ are also sub-processes of collaboration and are part/results of the communication efforts with specific objectives. ‘Accountability’ and ‘transparency’ are sub-processes to make sure that the collaboration meets these specific criteria.

The relations are presented in a conceptual model of these eight factors of Governance.

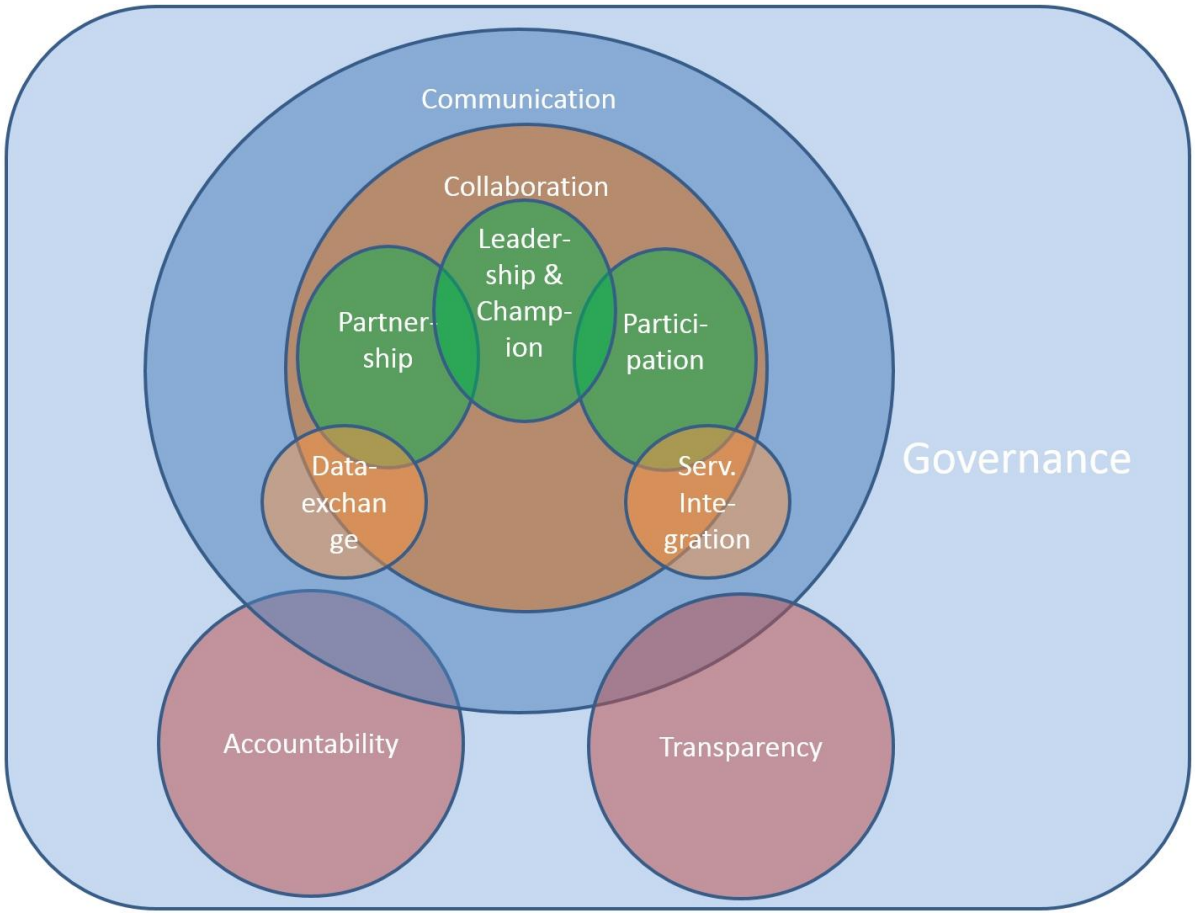


Fig. 4.10 Conceptual model Governance aspects

Governance sub-processes in relation to implementation power

Based on these definitions of the governance sub-processes I made an estimation of the impact of governance factors on the core implementation factors (technology, organization, policy (TOP) influencing the implementation power of a Smart City initiative in the model of Chourabi et al. (2012). My overall conclusion is that almost all factors have influence on organization and policy aspects, while only some factors have influence on technology aspects.

Influencing governance **sub-proces**	**Technology**	**Organization**	**Policy**
Collaboration	++	++	++
Leadership &champion	+	++	++
Participation &partnership	++	++	+
Communication	--	+	+
Data exchange	+	0	+

Service & application integration	++	+	++
Accountability	--	++	++
Transparency	--	++	++

Table 4.2 The impact of Governance factors on the core TOP-factors

Based on the description of the sub-processes an estimation can be made of the impact of these factors during the different phases of an initiative. The table below shows that there are only small differences between the impacts of the separate factors during different phases. My overall conclusion is that these factors of governance in general have influence during the complete lifecycle of an initiative.

Influencing governance factor	**Initiation Phase**	**Planning Phase**	**Implementation Phase**	**Evaluation Phase**
Collaboration	++	++	++	++
Leadership & champion	++	++	++	+
Participation & partnership	+	++	++	++
Communication	+	++	++	++
Data exchange	0	+	++	+
Service & application integration	++	++	++	+
Accountability	++	++	++	++
Transparency	++	++	++	++

Table XXX The impact of Governance factors during the lifecycle of an initiative

4.5 Conclusions

Overseeing the characteristics of the eight sub factors/processes of governance, I can now draw some conclusions with respect to each of the identified factors and its impact on Smart City implementation.

The relations between the eight different governance sub-processes can be expressed more accurate than in the first representation (fig XX) like in the figure below.

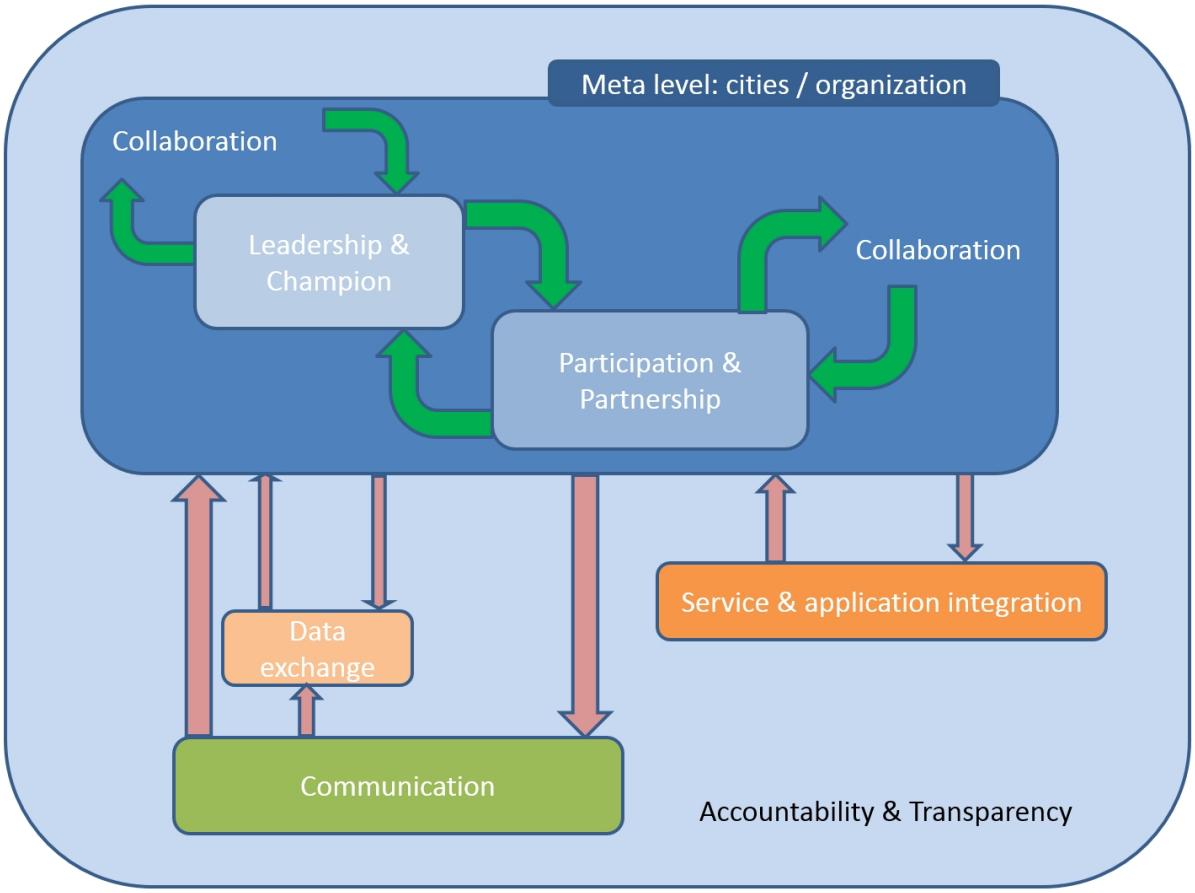


Fig 4.11 Visual model of the relation between governance sub-processes

Collaboration is the core sub-process of governance. Most initiatives need to start with people and institutions seeking collaboration to realize their objectives. During the life cycle of any Smart City initiative, at each point in time, the collaboration process will take place. Collaboration will be targeted towards common and individual goals, based on a shared vision and set of values, guided by leadership. It can be realized in many forms, concerning a wide range of actors, sharing data, information, and resources to create the needed synergy. Partnership and participation can be seen as results of the collaboration process, establishing and maintaining cooperation, to shape more formal or stable relationships. Leadership, partnership and participation are expected to contribute to the overall collaboration within an initiative. Therefore collaboration is essential for the internal innovation process of an initiative as well as the external process of building relations with parties outside of the initiative.

Leadership and champion is an essential role/process within the Smart City initiative. In order to build momentum, generate commitment towards targeted results, and engage stakeholders to ensure sustainability of the program. Mainly the importance of political leadership is mentioned in research, however executive (local) support, seems necessary as a mandate for action. A mayor can draw policy directions, build on alignment between different departments, and stimulate citizen participation. Building credibility and trust among the stakeholders is the core task of this role and process. Leadership is key to 'keep things moving' and keep stakeholders focused, therefore it is in intensive interaction with the collaboration process as influencer and as result.

Participation and partnership are two different sub-processes of collaboration with a comparable objective. Participation can be a formal or informal process of commitment, in order to involve and empower stakeholders to reach consensus and acceptance of Smart City solutions. Actors referred to

in this process are mostly citizens and local companies. A partnership is a coalition among stakeholders who share rights and responsibilities based on agreements in the more formalized form of contracts and policies. Actors in partnership can have many different roles, often with a key role for local government. As in the case of participation, partners cooperate in activities to support communication and the decision making processes to create synergy and added value. There is a thin line between partnerships and participation, both are essential to collaboration and highly influenced by leadership and communication.

Communication facilitates all governance sub-processes and is crucial for sharing information in various forms and interaction between all stakeholders. The main objective is to build and maintain trust and credibility between stakeholders, their initiative and their context. In this leadership is critical. Mass-communication can be needed at certain points in time, but personal interactive communication between stakeholders will remain essential.

Data-exchange is an important sub-process of (digital) information delivery, sharing among different authorities. There are many issues related to data exchange, especially in the form of open-data, regarding standardization of data-collection and privacy issues. Data exchange can strengthen the collaboration, management and governance since it offers a shared base of information to support a more open culture. Good policy is needed to determine what data can be made available to who at which point in time and on what level of detail or aggregation. If not, data exchange can create pitfalls to hinder the collaboration.

Service and application integration is supposed to unite different systems and functions to enhance the quality of living in the city. These integration activities, together with the data exchange form a technological pillar under many Smart City initiatives to support effective use of ICT-technologies. Integration is hereby a form of collaboration between the stakeholders. Organizational and policy innovation will often be needed as conditions to improve this process. Therefore service and application integration closely relates to collaboration, partnership and leadership to make this change happen.

Accountability is the process of willingness to accept responsibilities, enforcing collaboration, and facilitating democratic control. In order to be accountable, objectives need to be measureable, and decisions need to be logged. Being responsible entails that stakeholders can impose sanctions on each other when responsibilities aren't met. Accountability describes roles and responsibilities and thus the power and influence within collaboration.

Transparency determines a process of being open. It makes collaboration, partnership and participation, communication, data-exchange, service integration and accountability, visible to stakeholders involved. The quality of transparency is necessary to create a clear environment for all and to establish and support collaboration between different stakeholders and levels. Transparency is mainly concerned with the decision making processes and thus accountability within the initiative.

This analysis of the governance processes underpins the visual model of the relation between governance processes. This Governance-model, the characteristics per sub-process and the conclusions above can be used as the basis for the analysis of governance in specific situations.

5 Research Methodology

5.1 Introduction Research design

As Yin states, “not all qualitative studies start by having a research design” (Yin, 2015, p. 77). In this research, the research methodology serves as much as a plan for conducting the study, as well as a retrospective feature of the study. This chapter describes how to execute the research itself and the plan of approach.

This research has a qualitative approach, because to understand the perspectives of participants in Smart City projects, an in depth research is necessary to explore the meaning of Smart City governance, observe the process of governance in Smart City implementation, and identify patterns in this phenomenon.

Murcott (1997) argues that the key question for the qualitative methodology chapter is: How did you go about your research? In other words, what methods are used to answer the research questions? For this research several different methods are used. The information collected was used to explore success factors and barriers in Smart City governance, and may suggest actions to overcome the barriers as well as enlarge the impact of success factors. The used methods will be described below.

5.2 Research Method

As mentioned, this research is based solely on a qualitative approach, in which the focus lies on in-depth information rather than quantification in collection of data. Qualitative research usually follows an inductive approach, however for this thesis a deductive research method is chosen, using theory-guided research and sensitizing concepts. This research is building on previous Smart City literature, in which influencing factors, like governance have been defined in many ways. Following one of the leading academic Smart City establishment Chourabi et al.’s (2012) framework was chosen to find out if their interpretation of Smart City governance is inclusive and relevant in the Dutch context. Thus the following concepts or categories are used for observation: collaboration, leadership, participation and partnership, data-exchange, service and application integration, transparency and accountability. Using this deductive approach ‘can help to establish the importance (Yin, 2015) of Chourabi et al’s Smart City framework.

Using the deductive method is an efficient way to do research, however a “major risk… could be the premature loss of any fresh insights into the real-world events being studied” (Yin, 2015, p. 95). Therefore this research seeks to add dimensions to these concepts, or discard them in favour of new concepts that fit the emerging analysis.

In relation to the features of qualitative research mentioned by Yin (Yin, 2015) this research will: Study governance aspects of Smart City initiatives, under real-world conditions in two cities in The Netherlands: Amsterdam and Eindhoven. Specifically the urban area Amsterdam Southeast, Strijp-S and Eckart/Vaartbroek. It will represent different perspectives of the key stakeholders involved in the process. It will take into account the contextual conditions within urban areas of Amsterdam and Eindhoven. With the goal to contribute to gaining insights into this existing and emerging concept of governance behaviour in Smart City initiatives.

5.3 Research Phases and Techniques

Striving to use multiple sources of evidence rather than relying on a single source alone, the specific phases and techniques are explained in this paragraph.

Phases		
Phase one	Preliminary theory and interviews	Literature and interviews
Phase two	Test the theory and the viability of the concepts	In-depth interviews
Phase three	Analysing data, revise theory or dimensions of the concept	Coding, matching literature and interviews
Phase four	Participant feedback	Check results
Phase five	Interpreting and concluding	

Table 5.1 Phases research

5.3.1 Research phases

First phase: Literature study and participative observation

Preliminary research on and analysis of core concepts, perceptions and definitions of Smart Cities. An internship of 6 months at the municipality of Amsterdam in 2015 gave the possibility to acquire insight in Smart City development from practice contributing to a part of the Transform project while supporting the international project manager. The next step in this phase consisted of Literature study, defining this study's contribution in relation to existing literature. Here the governance factor showed to be critical in Smart City implementation. Furthermore characteristics, drivers, and barriers in relation to Smart City implementation have been discovered.

Second phase: Test theory with experts and in case study

An interview round with Dutch Smart City experts and Academic experts in the field have been set up in relation to the quality and completeness of the governance factors found in literature, and the contribution in relation to existing literature. Through the expert interviews feedback was received on proposed definitions of governance and related sub-factors. For each governance sub-process a literature analysis was made to retrieve success factors, barriers and definitions. This resulted in a list of 85 success factors and barriers, all related to one of the eight sub-processes.

After this first 'pilot' of governance factors has been held, the In-depth case study research started in which a wide range of stakeholders of Smart City initiatives in Amsterdam and Eindhoven are interviewed. The conceptual model of Governance processes and corresponding definitions was the basis for testing this information in the case study.

Third phase: Analysing data

The interviews were transcribed and reduced to a set of statements per interviewee, making up to a total of 241 statements. Each 'relevant' statement was categorized as a success factor or a barrier and related to one of the eight sub-processes of governance. For each statements was determined whether it was related to a known element from the literature study or whether it was a new found element.
This results in a list of relevant factors from the case studies that are categorized to the eight sub-processes of governance.

To describe the case a timeline approach is chosen, instead of the above described analytical approach. A descriptive model from the literature is selected to be used as a phasing model to describe the case history. For this approach all information from the interviews is coded to relate each statement to a specific phase in the life cycle of the case. By regrouping all the statements on this timeline they could be used to describe 'the story' braiding the expressions of the interviewees. Conclusions are formulated concerning the governance impact in both cases

Fourth phase:
Feedback participants

Fifth phase: Interpreting and concluding
The findings from the case studies are confronted with the analytical framework and can result in adjustments of the framework. Conclusions can be drawn concerning the usability of the framework for analysis of Smart City initiatives and for the improvement of new initiatives.

5.3.2 Research techniques

Literature study

The Literature study part has been part of the explorative and prescriptive research. To develop and answer the research questions many sources have been used to examine the current level of knowledge. These range from corporate literature to public literature, but is mainly based on academic literature. Since the Smart City topic is widely discussed in Industry and Government sectors, these sources are included to describe the field. The more popular sources have a higher risk of being biased, since the industry and/or municipality can have their own agenda and objectives in Smart City developments. However for this popular topic even academic sources might be biased. This might be the case an article "A Smart City Initiative: The Case of Barcelona" by (Bakıcı, Almirall, & Wareham, 2013), which looks more like a marketing folder than critical research. This bold statement was shared by the first academic reviewers of this article, nevertheless it hasn't stopped this article from being published.

Taking a critical view towards publications into account, main literature sources consulted are Google Scholar, Science Direct, Scopus, and repositories of universities worldwide. The topics searched for relate to: Smart City (or Smart Cities) implementation, Smart City governance, Smart City development, in combination with the following terms: barriers, success factors, drivers, challenges, issues, and opportunities have been used.

The literature review continued throughout the process, to keep findings as up-to-date as possible. Final literature research took place on the 1st of May 2016.

Case study research and selection

Yin stated that evidence from multiple cases is in most conditions more compelling than a single case study. However researchers seem to differ on this thought. For this research two 'leading' Smart Cities in the Netherlands have been chosen (Letaifa, 2015). Both cities have joined a European funded Smart City program, in which they appointed specific areas in the city for implementing Smart projects.

The purpose of the case study is to explain causal link, describe interventions, illustrate and explore the situation. For this study a case study method was used to collect information on governance barriers and success factors in Smart City implementation in Transform Amsterdam and Triangulum Eindhoven.

Based on the research question 'How both Smart City initiatives are governed', emphasis lies not on the results or on the 'why' question, rather looking at the process of becoming smart. This method of case study is to study a phenomenon (the "case") in its real-world context (Yin, 2015). For both projects a list of relevant stakeholders was developed. The interviewees were selected to get a good spread of representatives of the different stakeholders. Each interview was estimated to have a

duration of one hour, because of the limited availability of the interviewees. This time limit made it necessary to focus on the main aspects of governance, because the time was insufficient to discuss all possible aspects in detail. From the sixteen selected interviewees on the case level, fourteen agreed to cooperate.

In-depth interviews

	Transform	**Interviewed**	**Triangulum**	**Interviewed**
European coordinator	R. van Warmerdam	Y	Roy Beijnsbergen (city level)	Y
Project coordinators **(municipality)**	B. Mantel G. den Boogert	N Y	Henk Kok	Y
Private Actors	F. de Leeuw (ArenA) Maris (AMC)	Y Y	T. van Dieren (Park Strijp Beheer) J. v. Eijkeren (SDK) R. Willemse (KPN)	Y Y Y
Knowledge institutes	-	-	Bauke de Vries (TU Eindhoven) Dujuan Yang (PHD, TU/e)	Y Y
Consultancy ICT	I. Wenzler (Accenture)	Y	Peter Dijkstra (Cisco)	N
Other	G. Baron (ASC)	N	J. Hijdra (Housing Association Woonbedrijf)	Y
Total		5/7		8/9

Table 5.2 Interview scheme stakeholders Transform and Triangulum

This qualitative study is based solely on a set of open-ended interviews, based on a conversational mode: “interested in the interviewees’ words and ideas, not in arraying the responses numerically.” (Yin, 2015, p. 32). Each interview was done in presence and partly using skype as medium. This research will provide selected dialogues from these interviews to illustrate important topics.

5.4 Building Trustworthiness and credibility

By using multiple sources of data, like project documentation, administrative documents, newsletters etc. the research validity is strengthened. Due to being involved as an intern at Transform, I could gain inside information in this Smart City initiative in Amsterdam. This showed to be beneficial for the research. However, I have to make sure to keep my bias aside, so I will not critically reflect my own subjectivity, beliefs, and interests on this analysis.

In order to prevent threats to the validity of the outcomes, the following strategies have been taking into account:

1. Intensive long-term (field) involvement, for the case of Transform, to produce a complete and in-depth understanding of field situations, including the opportunity to make repeated observations and interviews;
2. “Rich” data – to cover fully the field observations and interviews with detailed varied data;
3. Respondent validation – to obtain feedback from the people studied. In this case all interview transcriptions resulting in a selection of statements have been validated by the interviewees;
4. Search for discrepant evidence and negative cases – to test rival or competing explanations. Which are not merely alternative interpretations, but directly compete with each other.
5. Triangulation- to collect converging evidence from different sources
6. Comparison- to compare explicitly the results across different settings, groups, or events.

6 Case Studies Background

This chapter introduces the two European funded case studies Transform and Triangulum[2], used for this research. First a short introduction of the European Smart city programs is given, followed by an overview of both Transform and Triangulum.

6.1 Introduction European Smart City programs

Transforming Europe's hubs into smart cities and communities is a priority for the EU. That's why the European Commission launched the European Innovation Partnership on Smart Cities and Communities (EIP-SCC) in July 2012, bringing together European cities, industry leaders, and representatives of civil society to smarten up Europe's urban areas, meaning: to improve quality of life, growth, jobs and decarbonisation.

The EIP-SSC targets for 2016 are to have at least 100 cities active in this partnership in different groupings to strengthen the demand for tested solutions. 100 key industry partners will cooperate developing innovative solutions, including the needed business models and financial solutions. Other key parties, like academia, governments, associations and other institutions, as well as civil society will join these initiatives to support their success. "This joined effort should result in a growth of available open solutions and ease the way to roll out and up scaling" (bron). Their roll-out actions are among others to establish interoperable urban platforms, with the aim to increase pace and scale of roll-out of open solutions, approaches for citizen engagement including co-design and co-creation.

The Seventh Framework Programme for Smart Cities and communities (FP7), had a budget for 2013 of 209,000,000 Euros for cooperation on ICT and Energy to develop Smart Cities (bron). This FP7 framework, was the European Union's Smart City Research and Innovation funding programme for 2007 – 2013.

The current programme is Horizon 2020, but there are many projects funded under FP7 which are still running. The European Horizon 2020 programme is a framework for research and innovation meant for implementation and demonstration of projects, like Triangulum. In this programme, projects are innovatively applied by international triple helix partnerships on themes of ICT, Energy and Mobility. It has an investment agenda for the years 2015-2020 in which about 80 billion euros are available.

The FP7 and the EIP under Horizon 2020 provides several funding schemes related to the initiative called 'Smart cities and communities'. The goals of the initiative include a 40 per cent reduction in greenhouse gas emissions by 2020 through improvement in the energy distribution networks and transport systems (Vanolo, 2013). With these projects or programmes the EU is trying to ensure that smart solutions for cities can be explored, implemented and replicated.

The figure 6.1 shows the current phase of 'Smart Cities and Communities' is focusing on Pilot Projects and Demonstration and Evaluation (in the development and validation phase).

[2] Transform and Triangulum are in different sources described as 'projects' or as 'programs'. Being a part of a European programme they are often typed as 'project', but being a collection of projects by itself it can also be seen as a program. For this thesis I will actively refer to them as 'projects'.

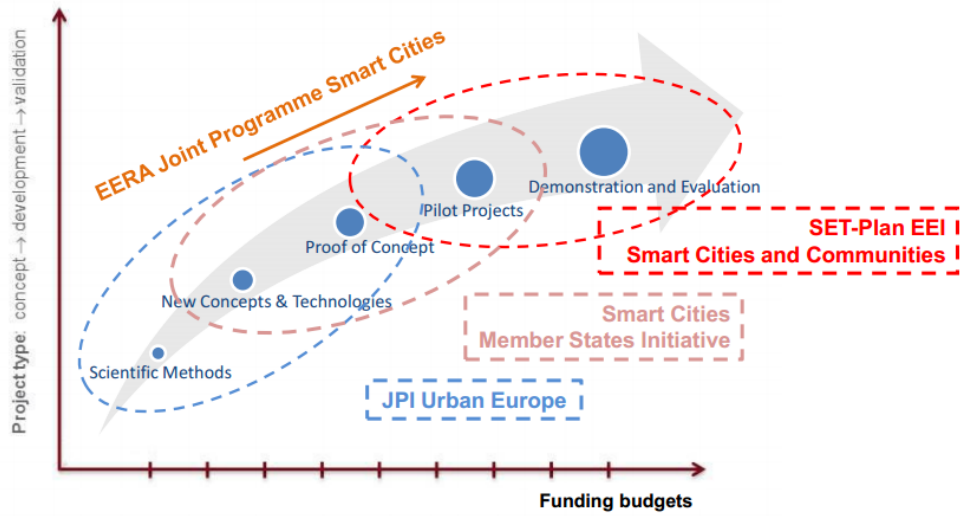


Fig. 6.1. European RDI Funding in the Urban Field (Swarz, 2012)

Transform started still in its fundamental research stage in the phase of 'new concepts & technologies - proof of concept' making plans to become a pilot project after finalising the project. Whilst Triangulum on the other hand, uses more mature innovation projects, with a higher 'Technology Readiness Level' (TRL). Triangulum lies in de 'red' zone, as a 'pilot project – demonstration'.

The European Commission (EC) has published a Technology Readiness Level (TRL) list ranging from TRL 0-9. See the figure 6.2 below.

TRL 0: **Idea**. Unproven concept, no testing has been performed.
TRL 1: **Basic research.** Principles postulated and observed but no experimental proof available.
TRL 2: **Technology formulation**. Concept and application have been formulated.
TRL 3: **Applied research**. First laboratory tests completed; proof of concept.
TRL 4: **Small scale prototype** built in a laboratory environment ("ugly" prototype).
TRL 5: **Large scale prototype** tested in intended environment.
TRL 6: **Prototype system** tested in intended environment close to expected performance.
TRL 7: **Demonstration system** operating in operational environment at pre-commercial scale.
TRL 8: **First of a kind commercial system**. Manufacturing issues solved.
TRL 9: **Full commercial application**, technology available for consumers.

Fig. 6.2 Technology Readiness Levels in the European Commission (EC) (bron).

For Transform the projects ranged from low to high TRL levels. Some projects started at a low TRL level, being ideas, unproven concept, without being tested. However some project ideas used technologies that were already used as full commercial applications (like the Solar panels, or the organge gas station).

According to the alliance manager of Triangulum, the projects in the Triangulum call had to be of a TRL level between 7 (demonstration system; operating in operational environment at pre-commercial scale) and 8 (first of a kind commercial system-manufacturing issues solved).

Lighthouse initiatives, living labs and Smart Urban labs,

Transform and Triangulum both make use of a living lab. "A Living Lab is a real-life test and experimentaton environment in which users and producers co-create innovations. Living Labs have been characterised by the EC as Public-Private-People Partnerships (PPPP) for user-driven open

innovation" (bron, p.8). The concepts of 'Lighthouse Initiatives', 'living labs', 'test labs', 'smart urban labs' etc., are proposed by the European Commission as new vehicles to support future success in deploying smart city solutions on a larger European scale to realize the 20/20/20 goals, across the three domains mobility, built environment and infrastructures using ICT. "Over the next 7 years the EU envisage a portfolio of at least 20 – 25 lighthouse projects, each with approximately 6-10 cities (and partners), which have the potential for Europe wide roll out. In the knowledge they can apply tested solutions – that will be better, faster, and cheaper to implement" (Azamet, 2015).

There is a variety of different set-ups of Living Labs. Brankaert (2016) found that Living Labs "emphasize the natural context of users, while others search for a more experimental control. Some focus on testing concepts with users, while others focus on co-creation of new solutions together with users" (Bron, p.9).

Successful Smart City

The EU uses two definitions of success, for Smart City initiatives and cities:

Successful initiatives: observable indicators through the life cycle of the initiative: attracting wide support, having clear objectives aligned to policy goals and current problems, producing concrete outcomes and impacts, being imitated or scaled:

- Be 'smart' (there should be a significant role for ICT enablers);
- Contribute effectively to achievement of EU 2020 targets;
- Be innovative;
- Offer sufficient information to assess its success.

Successful cities: having meaningful objectives (aligned with Europe 2020 and actual outcomes) covering a mix of policy targets and characteristics; having balanced portfolio of initiatives; attaining maturity; actively joining in Smart City networks (European Commission, 2013a).

City innovation in Amsterdam and Eindhoven

On 8 April 2016, the European Commission awarded the title of European Capital of Innovation 2016 to Amsterdam "for its holistic vision of innovation related to four areas of urban life: governance, economics, social inclusion, and quality of life" (European Commission, 2016). Amsterdam was selected and won for embracing a bottom-up approach based on smart growth, start-ups, liveability and digital social innovation. With this edition of the award, the European Commission's aim was to celebrate the European city that is building the best 'innovation ecosystem' – connecting citizens, public organisations, academia, and business – with a view to helping the city scale up its efforts in this field. Among the other eight European finalist one other Dutch city was selected: Eindhoven: "This city combines digital technology with creativity in its world-leading urban smart lighting strategy" (European Commission, 2016).

This introduction shows that both Amsterdam and Eindhoven are aiming at innovative urban development. In the following, I will discuss two European funded Smart City initiatives: Transform and Triangulum. One can imagine these European funded projects both have contributed to being leading Smart Cities in the Netherlands. I will introduce the cases below, findings on the influence of governance factors on implementation will be presented for both cases in further detail in Chapter 7 and 8 respectively.

Transform is hardly a successful initiative according to the EU definition: there are no observable indicators through the life cycle, it is attracting wide support in the area, it has no clear objectives formulated in SMART terms, its only concrete outcome is a process environment of collaborating partners in search of viable ideas, no solutions to be imitated or scaled;

Triangulum could be successful according to the EU definition: the necessary indicators are still under development, it is attracting wired support although participation is a barrier, it has clear objectives although the relation between the objectives and EU-targets is somewhat loose; the type of projects selected have the potential for imitation and upscaling.

6.2 Transform and Triangulum

Transform

Transform was a European funded programme executed between January 2012 and August 2015. This initiative is a European collaboration, with six cities on the consortium: Amsterdam, Vienna, Lyon, Genoa, Hamburg and Copenhagen and thirteen partners from industry and research worked together to improve policy and programs to lower carbon dioxide emissions. From the six working packages, in this research I will put the focus on Work package 4: 'The implementation plan', and especially the one in relation to the Smart Urban Lab Amsterdam.

"The Implementation Plans are focusing on the conception of new energy systems, the quality and transformation of building stock, economic and legal prerequisites and – very importantly for making implementation happen – governance issues." (TRANSFORM, 2014b).

> Transform supports those local stakeholders, responsible for investment and policy decisions, to turn their CO2 ambitions into a Transformation Agenda and into tangible Implementation Plans. Plans that focus on both the strategic and long term horizon, combined with executable projects. Plans that focus on both the city and regional level, combined with interventions in specific neighbourhoods. Plans that take into account all relevant energy flows, environmental aspects, urban mobility, water and waste. Transform stands for an integrative approach to smart city development, including strong stakeholder involvement, data analytics and smart tooling, financial strategies and methodologies for co-creation, like service design thinking. The outcomes set standards for future European Smart City projects (Amsterdam, 2015).

Transform is often described and refered to as a 'project', probably because it is a part of the FP7 'programme'. Looking at the objectives, organisation and different activities Transform has the characteristics of a programme, including different projects. Given this situation, it is unavoidable that in the citations and the thesis the typing of Transform may vary between project and programme.

Triangulum

Early 2015 the Triangulum project started in Eindhoven. This 25 Million euro project is funded by the EU as so called 'Lighthouse project' that will serve as an example for other cities in Europe.

> The Triangulum consortium combines the expertise of 22 partners from research, business, and cities from six countries in Norway, the Netherlands, United Kingdom, Germany, the Czech Republic and Spain . . . Each of the participants has extensive experience and knowledge with regard to smart urban development and has been involved in national, European or international research and demonstration projects or networking activities in the area of smart cities (Fraunhofer-Geselschaft, 2015b).

The three leading cities are Eindhoven, Manchester and Stavanger. At every city the consortium consists of the municipality of the city, local SME's, the University the City, and a citizens' platforms.

In this project the word 'Smart' mainly refers to the use of data and ICT in combination with measures to improve the quality of life in the urban environment, particularly in the fields of energy and mobility.

The Triangulum mission consist of ten statements: demonstrating real smart city solutions; looking beyond subsidy and demonstrate working business models and social value models; minimize risk for future smart city investments; co-create with citizens; transfer knowledge; seek to activate and enable entrepreneurs, SMEs and young talents by creating an attractive eco-system; develop and implement a smart city reference model; sustainable transformation of existing buildings and demonstration of solutions for shifting energy demand; build upon the replication potential of follower cities; and contribute to strengthen the European Smart Cities Movement (Fraunhofer-Geselschaft, 2015a).

In the next table I will give a short summary of both programs on relevant aspects.

	Transform	**Triangulum**
Consortium European level	Amsterdam, Vienna, Lyon, Genoa, Hamburg and Copenhagen	Eindhoven, Manchester, Stavanger,
Cities	Amsterdam	Eindhoven
Smart Urban Labs	Amsterdam Southeast	Strijp-S Eckart/Vaartbroek
Period	1st of January 2013 until the 30th of June 2015. Status: Completed	1st of January 2015 – 31 December 2019 Status: Ongoing, running or 21 months
Local Partners/stakeholders	ASC, AMC, ArenA, Liander, Nuon, HvA, Ikea, ING, ABN, etc.	KPN, Woonbedrijf, Technical University of Eindhoven, Municipality of Eindhoven, VolkerWessels
Themes	Energy	Energy, Mobility, ICT, focus on intersections
Goals	EU 20-20-20 targets	EU 20-20-20 targets: energy-efficiency & low carbon development
Innovation level	Immature	mature (TRL 7-8)
Type subsidy	FP7 Research & innovation Project	Horizon 2020 Implementation project
Funding (Euros)	Total project 7.5 M, of which 5.6 M by EU.	Total project 25, Eindhoven; 6,4 M, '254 months'
Key Roles	Cities and industry	Cities, industry, academic and citizens

Table 6.1 overview Transform and Triangulum (own. Ill.)

6.3 Description model

To tell the story of the specific cases, I describe the activities in a sequential time frame. From the literature on Smart City I selected the roadmap of Barcelona, described by Luca Mora, as an appropriate frame for description (Mora & Bolici 2016).

Mora describes a phasing for the development of a programme as an iterative process including the development of projects within the program. This approach fits well with the characteristics of the selected cases Transform and Triangulum. His selection of steps has a reasonable match with the governance sub-processes described in chapter 4. Not all steps are as relevant for these cases, but it

shows to be a useful guideline. The description of the steps are complemented with input from official documents as well as quotations from interviewees.

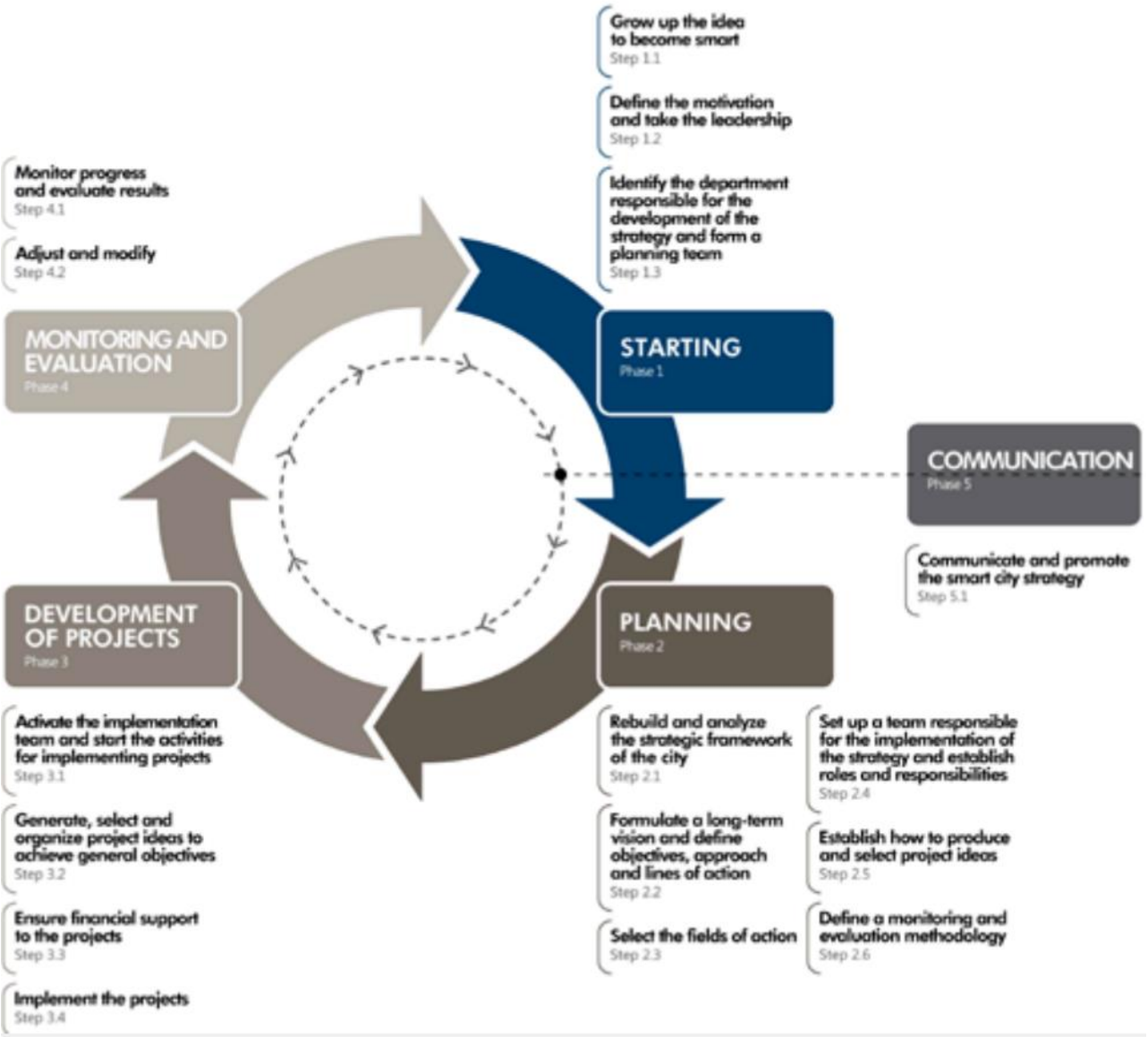


Fig. 6.2 The development process of the Barcelona Smart City strategy (Mora & Bolici, 2016).

7 Case Transform

What governance sub-factors have been used to stimulate the implementation of European funded Smart City initiatives in Amsterdam?

To answer this question I will build on my experience during my internship at the Transform project. In this case study I focus on 'work package 4': the implementation plan. Therefore the documents from this work package are used as main sources of information, together with outcomes of interviews with the key stakeholders. The case is described mainly in chronological order using the model of Mora as a reference framework: the paragraphs 7.1 to 7.4 and their subdivision. In the case description the focus is on the development of the governance aspects. For each phase I have formulated conclusions concerning the governance aspects.

7.1 Starting

1.1 Grow up the idea to become smart

Amsterdam started to grow the idea of becoming a Smart City, with the 'Amsterdam Smart City' (ASC) initiative in 2009. It is seen as a platform to encourage all kinds of stakeholders to take Smart City related initiatives. The initiative was aimed at the diversity of municipal services, but also all kind of companies and organizations, including citizens. The main objectives for the municipality were to reduce the use of energy, to reduce the traffic and the corresponding nuisance and to improve public safety (Unknown, 2016d). On the evolving platform all kinds of activities are organized to stimulate stakeholder activities.

1.2 Define the motivation and take the leadership

Amsterdam advertises itself as a compact 'Smart International City' or 'Smart Global Hub'. This European strategy of Amsterdam, approved by the city council in 2012 (Amsterdam, 2012), is focusing on strengthening four pillars. Especially the pillars 2-4 show to be essential for their motivation towards a Smart City:

1. The position as business hub, in which connectivity and trade are key;
2. Knowledge and innovation;
3. Sustainable city development towards a 'Smart City' and ambitious climate goals;
4. Active citizenship and participation.

Amsterdam's programme and cluster manager ICT, and head of the ICT project 'Amsterdam Innovation Motor', G. Baron, took the stage in 2012 during an international seminar, sharing details in pioneering Amsterdam Smart City initiatives. According to Baron the first starting point for Amsterdam as a Smart City was to focus on 'energy', and secondly on 'connectivity'. During the seminar he was transparent when he said "Everybody agreed on having ambitious climate goals, and there were loads of ambitious intentions by the city, but nothing too much happened actually" (Baron, 2012, p.2). The city of Amsterdam started an energy transition programme to implement 'no brainers' like building insulation, but also to start innovation together with grid operators, and other companies. "We want to bring parties together . . . create impact . . . We want to have companies, knowledge institutions, governments and individuals come up with ideas . . . Collaboration is key" (Baron, 2012, p.2). At this stage a living lab approach has been chosen to further develop the Smart City ideas. From 2008-2012, about 25 projects have been developed in which the city becomes more and more an open platform for innovation.

In 2012 the city of Amsterdam decided to respond to an EU-call for ENERGY-SMARTCITIES-2012 and participate in the Transform project, organized and supported by funding from the European Union's 7th Framework Programme for Research and Technological Development (2007 – 2013), part of an ongoing series of investments in technology research and development across Europe. 'TRANSFORMation Agenda for Low Carbon Cities', as Transform is called officially, was an initiative of the EU to support the realization of the EU 20-20-20 targets on climate change "by the integration of energy in urban management. In interactive Smart Urban Labs, stakeholders will be able to turn ambitions into tangible Implementation Plans" (EU Commission, 2012). As such, Amsterdam's motivation to join the Transform project was the "Guided process with major stakeholders, leading to commitment of 202020 goals, by renewable energy production and use of latest technologies in existing building stock" (TRANSFORM, 2014b, p. 9). The Transform project was about becoming a Smart 'Energy' City.

The motivation for collaboration between the municipality and stakeholders in Amsterdam is based on the fact that the city, in contrast to other Transform cities like Copenhagen or Hamburg, doesn't have enough power for an energy transition. Which is confirmed in the interviews as "Energy transition is not for cities or politicians to decide on, so they cannot govern it either. They can try to facilitate, seduce, or subsidize . " (International Coordinator R. van Warmerdam)., and "The city really needs the other stakeholders and therefore fulfils the role of unifying and facilitating management" (I. Wenzler from Accenture).

A small group of stakeholders wrote the proposal with intensive involvement of different services in the municipality of Amsterdam. The municipality, became coordinator for the project, since they took the initiative and leading role in writing the proposal for the Transform consortium. The consortium that supported the project was brought together from leading cities and companies, mainly from the Western-European countries. The cities Amsterdam, Genoa, Hamburg, Copenhagen, Lyon, and Vienna all defined areas for the Smart Urban Labs. Amsterdam chose one of its earlier appointed living labs: Amsterdam Southeast. The municipality of Amsterdam and the consultancy company Accenture were the only Dutch participant in the consortium on a European level. Furthermore, private companies like Siemens and ARUP, energy suppliers and research institutions were involved. The consortium thus was built along the lines of a triple helix cooperation as promoted by the EU for Smart City development. The budget for the project was established at about EUR 7.5 million with an EU contribution of about EUR 5.6 million.

1.3 Department responsible for strategy and planning team

In the preparation phase each city selected an area as Smart Urban Lab, set up a local team to work on the Implementation Plan (IP), arranged local resources to (co)finance the making of the IP, and made a decision to make an IP for the integration of energy planning and urban development" (TRANSFORM, 2014b, p. 52).

On a local level, the department responsible for the development of the strategy for Transform was the 'Amsterdam Energy and Climate Office' who took the initiative and started as the accelerator of the process in the SUL of Amsterdam Southeast: "The office is part of the urban planning department [Dienst Ruimtelijke Ordening (DRO)], to make sure energy and planning are combined" (TRANSFORM, 2014, p. 81).This office made use of the existing relations with stakeholders in the ASC-platform: "Some members of the Amsterdam Transform team were part of ASC, a strategic partnership" (TRANSFORM, 2014a, p.33). The, Climate Office, worked on two levels: the international consortium sharing information between the different cities and the local organisation trying to realise concrete improvements.

Analysis Governance starting phase

Clearly the municipality of Amsterdam shows leadership by promoting the Smart City idea and advertising itself as a Smart Global Hub, creating an environment for a network of stakeholders (ASC) to contribute to this idea, by selecting an energy programme with a specific focus, and having a living lab approach in which the city becomes a platform for innovative smart projects. These high ambitions are not always fruitful for success, as mentioned in 2012 by G. Baron, the current Chief Technology Officer of Amsterdam.

The municipality showed active leadership by responding to European sponsorships, to engage in Transform in a coordinating role, and having ambitious goals for the city. Next to this active leadership role, the municipality has a facilitating leadership role –offering the support and conditions for the participants to excel - verbally and physically promoting collaboration in public private partnerships.

I think the motivation for this public, municipal leadership role is driven by high ambition, the Amsterdam Smart City image, and the possibility to receive funding. This image is improved by the Smart City platforms, rewards, living labs, and European programs. It shows companies and citizens that Amsterdam is creating an innovative, liveable and sustainable city. The financial motivation is stimulated by receiving EU funding. The European contribution on the Transform project is about 75%. Therefore the EU itself has the leadership role of becoming Smart, with the Horizon 2020 programme, mainly motivated by contributing to employment, innovation (and international competition), and liveability in Europe. On the European scale, the necessary collaboration is stimulated by organizing international triple helix consortia.

7.2 Planning

The Transform project consisted of six work packages. Again, this case analysis mainly focuses on WP4: the implementation plan (IP) because this should be the basis for prolonged development, and actual implementation, of Smart City projects in the SUL.

> Starting from different stages of development (planning and implementation phases) in the Transform cities, the presented implementation plans were made in two years' time from the start of the Transform project in January 2013, until the end in December 2014. The implementation period that will follow, has a scope of about 5(-10) years. Depending on the task and the specific situation of an urban area, the length of these periods might differ. (TRANSFORM, 2014b, p. 46)

What was expected to be delivered during the Transform project were IP's for the SULs "defining paths to meeting the energy and CO2 targets and a roadmap of how to scale up afterwards" (TRANSFORM, 2014b, p. xx). These plans should at district level address practical and local aspects, and be tangible, including who is involved in which projects and what the business and finance models of the projects will look like. These plans should also be linked to the city wide strategies.

An overview of the road taken towards the IP for Amsterdam Southeast (see image below) shows the different themes for the SUL, the intensive lab session (ILS) and IP, and other important 'moments' during the Transform project.

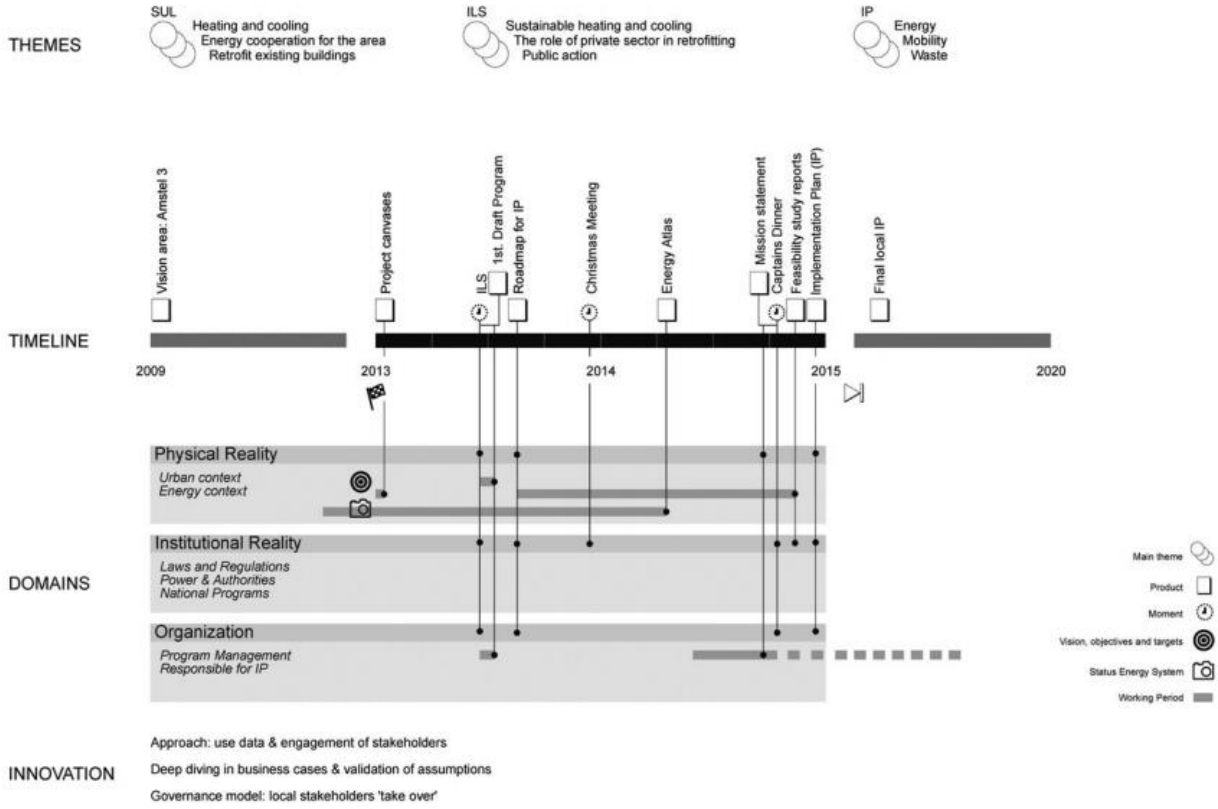


Fig. 7.1 Road towards IP – Amsterdam Zuid Oost (TRANSFORM, 2014b, p. 46).

2.1 Rebuild and analyse the strategic framework of the city

Because the local Transform teams will set up an IP for its SUL, closely linked to the city wide strategies, it is relevant to know the strategic framework of the city of Amsterdam:

> For the medium long term Amsterdam has a strategic plan. This plan makes a distinction between the inner city, the urban and infrastructural zone around it and the area outside the circular zone. The SUL is located in the outside zone. In this zone the investments in the medium long term are mostly directed towards social and economic programs and less to area development (TRANSFORM, 2014b, p 10).

With the European Smart City strategy for Amsterdam, the Amsterdam City Council wants to put the Amsterdam Metropolitan Area prominently on the European map. The City of Amsterdam states to believe strongly in the added value of knowledge and best practice sharing between countries, regions and cities. On a city scale, the European strategy for Amsterdam is “to reduce CO2 emissions by 40% in 2025 [compared with 1990 levels] and to position the city as a front-runner in the field of integrated sustainable urban development” (Gemeente Amsterdam, 2012, p. 1). The vision on the medium-long term for the SUL, Amsterdam South East, is to integrate housing into the offices area and make it a more lively, socially save and attractive environment. It shows that there is a difference between the local and the comprehensive, city-wide energy strategy. Within a city-wide framework of objectives and energy strategies it is important to set specific targets and strategies for specific areas (TRANSFORM, 2014b, p. 27).

Amsterdam is mentioned (by the municipality itself) as a ‘best practice’ on linking city-wide strategies with district-specific energy system development approaches, through the ‘Amsterdam with Smart City Umbrella strategy approach’: “There is the strategy in Amsterdam Energiek Zuid Oost, which

works as an innovation motor. The city supports projects coming through the stakeholder process, accompanying reflections to the city strategy are made" (TRANSFORM, 2014b, p. 74).

2.2 Formulate a long-term vision, and define objectives, approach and lines of action

Vision

Already in 2009, the vision for the area Amstel 3 (Amsterdam Southeast) has been published, this is the same area chosen to be the Transform SUL in Amsterdam. This office area should be transformed into a mixed-use working-living area. This area had high vacancy in 2011-2013, the Project office Southeast estimated about 30% (200.000 m2) vacant office area, of which half is vacant for over three years. This 10-year vision is mainly based on increasing value for the area, by switching from mono-function to multi-function, in which the municipality offers 'space for initiatives' by the market. The municipality is already facilitating and stimulating developments, for example by adjusting regulations. In this area, sustainability and the reduction of energy from fossil fuels where already on the agenda in 2009. The Amsterdam Arena, located in Southeast, as an independent organization with the municipality as one of the shareholders, developed a 5-year development plan 2010-2015 'Amsterdam ArenA - Naturally sustainable', as a policy to compensate the natural nuisance that comes with the function of a large stadium (ArenA, 2016). This background explains why in Transform "Stakeholders could easily find each other under the label 'sustainability" according to de Leeuw, (ArenA).

Objectives

The positioning and objectives for Transform are prior described by the EU as follows:

> Transform's integrative approach brings operational plans to the strategic level, including strong stakeholder processes, data analytics and takes into account all relevant energy flows, environmental aspects, urban mobility, and the interrelation of possible measures and their costs. This integration of elements creates win-win business models for stakeholders with initially different interests.
>
> . . . Transform supports cities with implementation plans embedded in integrated planning, improves insight in stakeholder processes, financial strategies, the use of data, and the possibility to find better economics by using analytics.
>
> The power of Transform is the combination of practice and scientific insights. The delivered Key Performance Indicators and models for integrated planning and data analysis set standards for the European Smart City project. All European cities will benefit from this approach in their change from business-as-usual to low carbon strategies.
>
> City-to-city replication and implementation of the results are a crucial element of Transform. The project mobilizes stakeholders and politicians of European cities through the extensive networks of all Transform partners, for example by providing master classes and through a strong political Memorandum of Understanding. (EU Commission, 2012)

This text reads as a marketing brochure. This shows the Transform project is a highly complex project and shows how high the ambitions are in views of the European Commission (EU Commission, 2012).

The main Key Performance Indicators for TRANSFORM are:

- Reduction of CO2 emissions;
- Reduction of energy demand;
- Increase of local renewable energy production;
- More efficient use of remaining fossil fuels

Reflecting on these objectives after Transform, the international coordinator found that the EU indicators were unrealistic because:

- Energy transition is beyond the direct influence of politicians and municipal service managers;
- The European level lacks management power and the possibility to steer on the quality of the output;
- The stakeholder representatives defined the quality, not the subsidizing body. So there was no objective external judgement on the quality of the results.

Specific (SMART) objectives for Amsterdam are not set at this stage of Transform, but are presented as output of Transform for the long term: "As a target for electricity and gas consumption -20% until 2025 is defined; CO2 emissions shall decrease by -40% until 2025. Additionally: individual targets of participating stakeholders" (TRANSFORM, 2014b, p. 73). The tension between the short term Transform project approach and the long term targets is signalized by the international coordinator, and people from the climate office, as a barrier for the entire Transform project.

Approach

On the local scale the SUL in Amsterdam was a transformation of an existing area (brown field development), in which many stakeholders are settled. Therefore a 'process approach' has been chosen. For Amsterdam the approach fitted to the leadership form of 'facilitating stakeholders': "The development strategy is based on facilitating and positive stimulation – institutionalizing a learning process: creating a knowledge base, informing, bringing possible partners together, connecting, organizing, helping to formulate projects and testing them, possibly supporting by funding" (TRANSFORM, 2014, p. 75).

In their evaluation report is stated that:

> Only in Amsterdam, a clear bottom-up process was initiated by municipal actors with the aim to put local stakeholders in the lead for the development. In contrast to this approach, the other Transform cities combine a top down approach with bottom up activities, but (in those cities) developments are rather started and governed by municipal departments or institutional actors introduced for management and implementation (TRANSFORM, 2014b, p.81)

For innovation, the approach was to use "data" and "engagement of stakeholders for deep diving in business cases and validation of assumptions", and by using a "governance model in which local stakeholders would 'take over'" (bron).

2.3 Select the fields of action

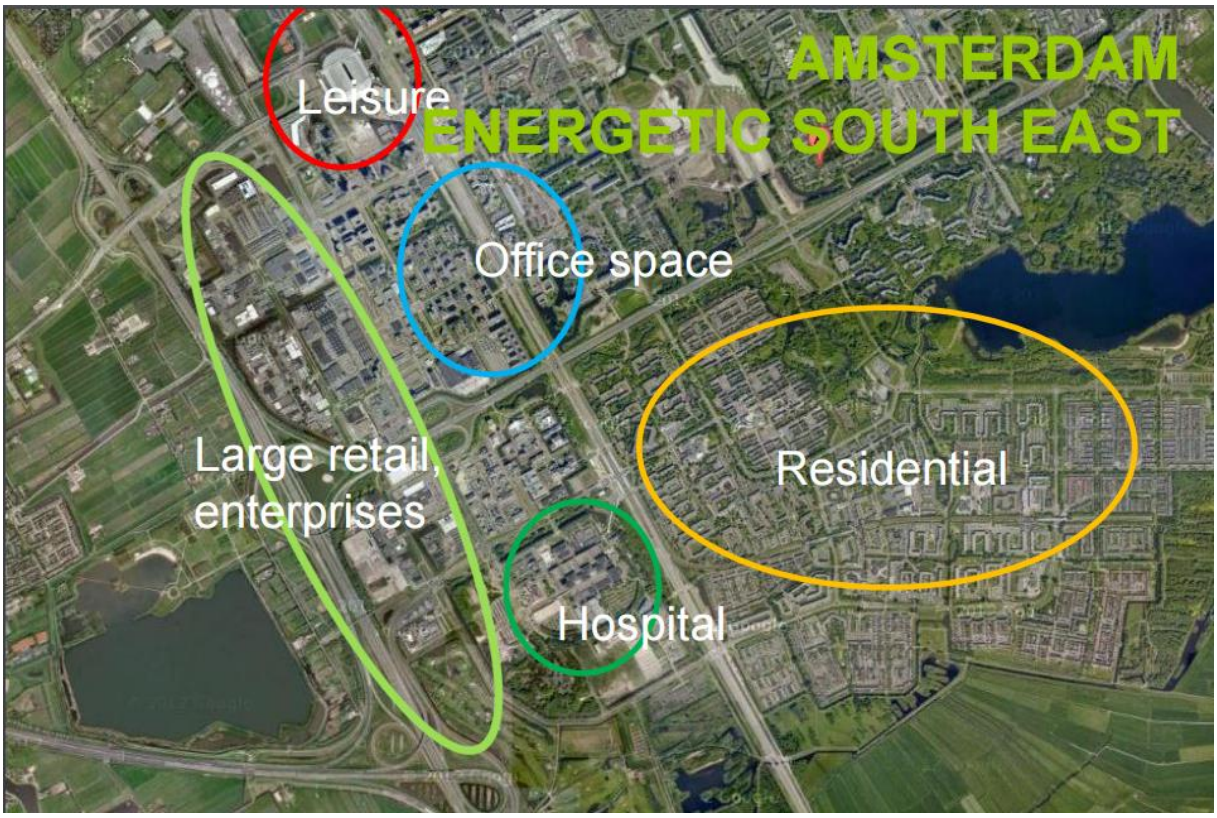
Themes of action

For Transform, the following themes, or fields of action, are agreed upon 'energy', 'mobility', 'waste, prior to the project. Projects will be about:

- Energy: decrease energy use, a smarter use of energy sources and renewables
- Mobility: public transport, car sharing, electrical transport, SMART use of ICT and smart use of space (also in relation to car parking)

- Waste: decrease waste production, use of sustainable and reusable materials and local processing of waste (TRANSFORM, 2014a, p.39).

The Smart Urban Lab: Amsterdam Southeast



Bron (http://www.intrepid-cost.eu/wp-content/uploads/2016/01/2016-04-21_INTREPID_Delft_Schremmer_01.pdf) p.6

As mentioned Amsterdam South-East was chosen as the urban area to establish a Smart Urban Lab (SUL). The SUL of about 300ha, is located outside the Amsterdam city ring. In this zone the plain municipal investments are mostly directed towards social and economic programs and less to actual physical area development. This existing mixed use area consists of leisure, retail, dwellings, offices and industry. The area houses 83.000 residents . However, for the SUL the focus was on the business area, between the AMC hospital and the Arena, instead of the residential area. The focus within Amsterdam South-East thus was on involving larger local companies, because they were identified as the energy-consuming stakeholders who could have an impact on the long-term objectives:

> In the plan area a total amount of 475,229 MWh and about 38.211 thousand m3 of gas was used in 2012. The energy usage in this area is about 10% of the usage of electricity in Amsterdam and 4,8% of the usage of gas. Based on the decision-making tool developed in this program, the Energy Atlas, Transform tried to develop new projects and energy solutions, mainly focusing on companies in the area with a large energy consumption. (TRANSFORM, 2014a, p. 16).

According to the climate office itself, strong points to start the intervention in South East were (TRANSFORM, 2014a, p. 27):

- Connections with the main stakeholders on the city level – within the cooperation of Amsterdam Smart city;

- Strong network building, the knowledge base of the physical planning department, the potential to translate knowledge in understandable products, the focus on sustainability;
- An impartial position in the area of South East;
- The possibility to test plans by the city alderman and connections with the national ministries and knowhow of funding possibilities.

2.4 Set up a team responsible for the implementation of the strategy and establish roles and responsibilities

In the beginning of 2012 local stakeholders of Sout East set out together on a journey towards common sustainability projects. Amongst the stakeholders are companies, nongovernmental organisations and public parties. Important satkeholders are the Amsterdam Medical Center, The ArenA Stadium, Evoswitch Datacentre, Stadgenoot Housing Corporation, IKEA, grid company Alliander, NUON/Vatttenfall, waterworkscompany Waternet and the Amsterdam Smart City Concsortium (TRANSFORM, 2014a, p.25).

As the climate office wrote: “The stakeholders will be together responsible for the final outcome” (TRANSFORM, 2014a, p.26). A core team was formed from the most active participating stakeholders

From my perspective, the most important stakeholders of the Transform-programme in Amsterdam were:

- The Municipality; in particular the Amsterdam Energy and Climate Office, “defining the process interventions that build up the network and the knowledge base. Organising workshops, working groups, bilateral contracts and setting up the energy atlas” (Vlaar, 2016);
- The Amsterdam Arena; owner of the Ajax soccer stadium. This organization has previously (2009) signed an agreement with the municipality to improve the sustainability for the area;
- The AMC hospital, owner of the hospital building;

Furthermore other organisations got involved in the process:

- Local grid companies, Liander and Nuon, who are producer and distributor of energy, and delivering data concerning energy usage. Nuon has located their headquarters in Southeast;
- Other local (private) companies, including banks like ING, ABN Amro, and schools like the Hogeschool van Amsterdam and the ROC, or the data centre Equinix and IKEA,
- Housing associations like Stadgenoot, Eigen Haard and Ymere.

Desk research and interviews did not reveal any link between the important Real Estate developers or Housing Associations and a specific Transform project.

According to the IP the City of Amsterdam was leading the initiative on an informal basis: “The Office of Climate and Energy, was most likely seen by other parties to have the role of leadership of the process and the setting up of the programme, but this role was never institutionalized” (TRANSFORM, 2014a, p. 26). During the initiative the leadership developed and also other stakeholders took up the responsibility to give guidance to the collaboration: “The status at the end of 2014 was that the Amsterdam ArenA, NUON (distributor and producer of heat and cold) and AMC hospital have actively been taking the role of leadership together with the city of Amsterdam and the city district of South East” (TRANSFORM, 2014a, p.26).

The ArenA Amsterdam, as a private stakeholder, had an intrinsic motivation on sustainability, ‘becoming climate neutral’ in 2015. They are mentioned by others (AMC, municipality) as the champion in the urban area by showing other actors that ‘it can be done’ and ‘how it is done’ in the case of the solar roof panels.

The collaboration between the stakeholders is built upon the absence of a hierarchy, as it is part of the governance definition I use. The Climate Office had a limited set of influencing instruments to stimulate collaboration: "The instruments were all about facilitating in a positive way without legal enforcement. The energy has been mostly directed on informing and connecting to foster cooperation and start up new markets (precompetitive procurement)" (TRANSFORM, 2014a, p.28). The core team consisted mainly of policy makers no members from city management were directly involved. According to one interviewee this was not an ideal situation: "The assurance at the board level was insufficient, it was mainly an execution of the civil policy makers, not at the highest level" (G. den Boogert from the Municipality).

Even if the intended collaboration is formalized in some way, it can remain very hard to come to real action: "I have a letter of intent signed off by the management of ArenA and AMC but still we switch to daily operations. It is very hard to actually realize an intention" (M. Maris from AMC).

Nevertheless, the stakeholder management in Amsterdam was 'admired' by the other Transform-cities "because there was collaboration between stakeholders from the beginning" (G. den Boogert from the Municipality/climate office). The Climate Office is capable of building bridges between the different stakeholders "it is a not for profit party, not coming to sell anything, so they have easy access to all stakeholders" (F. de Leeuw from ArenA).

But the Transform project was not of strategic importance to all involved stakeholders: "Slowly but surely, also the housing corporations disappeared from the table, maybe because the right representatives were not involved. They were too operational in focus and did not see collaboration as a target"(M. Maris from AMC). However, den Boogert (climate office) argues that "the housing associations didn't have their part to play in the area which is mainly consisting of offices, businesses and amenities".

Some interviewees give hints that the roles and responsibilities within the stakeholder collaboration could have been better defined: "The position of AMC remained unclear for a very long time. Indistinctness about their interests and possibilities" (ArenA). "Every manager has an instruction and if this instruction does not incorporate regional cooperation, he or she will be willing to act within limits, but will never be made accountable" (M. Maris from AMC)

The international coordinator frames the leadership situation as follows: "If tactical and strategic management in the partner organizations is not continuously linked to the operations, at making progress, doubt, decisions and solutions, you are getting isolated from the reality, the daily operations. That was the deficiency of Transform, the link with politicians and managers within the municipality was too thin. In such a situation, reports end up in a drawer" (International Coordinator R. van Warmerdam).

2.5 Establish how to produce and select ideas

Since the SUL Energiek Zuid Oost is a brownfield area within the city, and since there are no large urban developments planned, the strategy is to define separate projects and test what results they deliver. The main activities were focused on stimulating the stakeholders to work together in defining achievable projects.

> By evaluating projects, the decision is, and will be, to continue projects, upscale them, or to stop them. This Implementation Plan is about the setting up of this 'project machine' for the area in a more structured way. Therefore, the projects defined in this IP are to be understood as a snapshot in time. (TRANSFORM, 2014a, p.7).

2.6 Define a monitoring and evaluation methodology

> Next to the energy atlas, an energy balance was created for the area (rough calculations on demand and potential sources for renewable energy) and **also a monitor system to benchmark projects against city wide targets on CO2 reductions**. Using data this way, it structures the approach from the area (what are key elements for change) and validates bottom up projects on their relevance for the approach (TRANSFORM, 2014a, p.25).

However an actual methodology for monitoring and evaluation during the process, is not described in the Transform documents. Related to the chosen strategy, some stakeholders think such a methodology was not relevant: "We had not agreed upon objectives, so no monitoring was needed. The focus was on creating chances for the stakeholders in the area" (F. de Leeuw from ArenA). Other interviewees conclude that the lack of this methodology has been a barrier to realize concrete results and gain momentum, because evaluation did not provide insight in weaknesses in the chosen approach: "The link between projects and overall objectives was not clearly defined" (den Boogert from the Municipality).

Analysis Governance planning phase

The collaboration is seen as very positive by most interviewees, building on existing relations and networks, attracting new parties and resulting in new continuing relations. Stakeholder management was partly a success factor in the project. Using ASC as recruitment platform for the needed stakeholders accelerated the process. However locally, housing associations were present at the start, but left the table, for unclear reasons.

On a local scale, in Amsterdam Southeast, the Transform collaboration did not start off as an actual '**partnership'**. The approach of activating a network of stakeholders in an urban area without developing a formal structure for the collaboration resulted in an unclear situation. I found that the number of 'partners', or rather stakeholders, is varying in different documents and related webpages. Sometimes 'partners' are mentioned although they did not participate in a specific sub-project, while other 'partners' were only involved in the beginning. A barrier is that this collaboration was not formalized into a partnership before or at the start of Transform, however this might not have bee realistic either.

The right **selection of stakeholders**, with clear roles and positions for everybody is of utmost importance to avoid creating false expectations. Specific roles for the different stakeholders (named 'partners' on official transform websites) remained somewhat unclear. No clear selection on stakeholders (or their employees) meant that sometimes the wrong organisations got involved (Ikea), or the people lack the necessary skills knowledge or power (AMC), or even the time needed for effective collaboration. Also the activities were not for all stakeholders of strategic importance. The quantitative targets for Amsterdam, Energiek Zuid Oost were defined for the mid-term, thus leaving unclear what the contribution of the short term Transform project would be in a period of only 2.5 years. This shows that the focus is more on 'are the different partners doing the right things' than on 'are the partners together doing the things right'?

The facilitating **leadership** style in which the Climate Office was enforcing the stakeholder network can be seen as a success factor for collaboration. On the other hand, "the role of leadership [by the climate office] of the process and the setting up of the programme . . . was never institutionalized", leading to an unclear leadership situation. In the Transform project evaluation is therefore stated that leadership "was shared among the main stakeholders like Arena , AMC and NUON". However, only the active role of ArenA is supported in the interviews by statements of AMC and Arena itself, for example by driving sustainability in the solar project. AMC does not see itself so much as a leading organisation, and NUON only got involved lately in the process, and was not mentioned as a key partner to contact for this research by the climate office. I conclude that the leadership within the

stakeholder group is somewhat diffuse, inherent to the chosen strategy to develop a kind of 'own responsibility' among all stakeholders.

CEO commitment from the parties involved was lacking. The implementation plan states regarding this commitment: "To make an innovative transformation plan in a specific area, it is necessary to have strong committed actors in the area itself" (TRANSFORM, 2014a) p.33). This was not the case in Amsterdam, and can be seen as a lesson drawn. Interviewees add to this that it is useful to "Select parties that are involved in the area and also have a future interest to invest in the area" (G. den Boogert from the Municipality), and "Select partners with an image that is related to and partly dependent on the area (M. Maris from AMC). Almost 50% of the barriers mentioned by the interviewees concern the lacking role of top-management in envisioning a Smart City and championing the initiatives. Although the city of Amsterdam was 'in the lead', the commitment was mainly present at the level of the involved policy makers and not at executive level from the start, thus forming a barrier to drive through change and innovation to achieve quantifiable objectives and concrete results. This kept the project isolated from the normal execution processes at the stakeholders, making 'implementation power' insufficient available when needed.

Citizen participation is encouraged in the initiation phase by the European Commission, however in the planning phase, citizen involvement is not elaborated on. The Climate Office states Amsterdam was "the only city who used a bottom-up approach". I see the strategy for the municipality was to initiate Transform (top-down) as 'Smart City solution' for the area, involving local stakeholders (Bottom-up), making it a 'middle out approach'. A side effect was that "citizens were not involved directly in the project" (I. Wenzler from Accenture). Since the 'specific' SUL area chosen, consisted mainly of businesses. Citizen participation was not on the agenda, partly because there were not many inhabitants in 'this part' of Amsterdam South East, ignoring the 88.000 citizens in the other part of South East. So when stakeholder engagement is mentioned as a success factor in the Transform documents this relates to involving private companies and other institutes.

As a main result of Transform the mechanism of creating, selecting and developing project, the so-called 'project machine' is presented. However, how this project machine is working is not further explained. In other words**,** it is not **transparent** and/or clearly **communicated** how projects are selected, tested, and on what criteria these would be up-scaled or stopped. In this way it is not a good documented 'best practice' that can be easily adopted by other cities, as should be an EU objective.

Instead of a set of clear objectives, there has not been any attention to defining a methodology to monitor and control the progress within the project. Thus **nobody can be made accountable** when the process or projects needs to be monitored. This demonstrates a risk of these open networks: names and profiles can be used for marketing the idea without a proper vision on results that can be expected and the parties that are accountable. The Climate Office doesn't feel fully responsible for the project, mentioning: "The stakeholders will be together responsible for the final outcome". I conclude that the governance factors 'accountability' and 'transparency' were not given the attention needed.

7.3 Development of projects

Transform was a FP7 project, thus a research oriented project focused on creating knowledge about realistic plans and fitted strategies and approaches that could be brought to future implementation. In such a long lasting and complex process as realizing CO2 reduction by energy savings, it is clear that different cities have different starting positions and different possibilities to realize concrete

steps in the project period. The next schema shows the Amsterdam stage of development concerning energy planning:

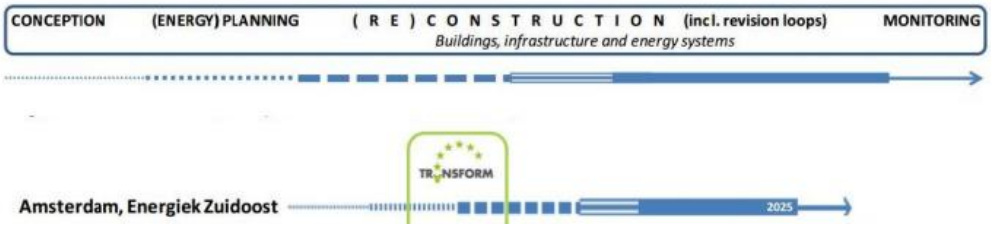


Fig. 7.3 Transform running time 01/2013-06/2015 (TRANSFORM, 2014b, p.11).

As can be seen, during Transform, Amsterdam South East (Energiek Zuidoost) was in the (energy) planning phase and, and according to the document, partly in the (re)construction phase. In this phase I will elaborate on what project developments have taken place.

3.1 Activate the implementation team and start the activities for implementing projects

The different stakeholders were all connected to the municipality but they were not working together on different projects in the urban area before the start of Transform. The leadership of the municipality brought the stakeholders together: "In general the SUL team in Amsterdam [Climate Office] has done three activities: setting up of a project organization within the city, organizing events in the process that built the network and the knowledge base, and the general project management" (TRANSFORM, 2014a, p.30).

In this phase a number of activities helped creating ideas about possible improvements in the area that would fit the overall objectives and at the same time stimulate local stakeholders to get involved. Two paths have been taken to generate ideas before the Intensive lab Session (ILS): Service design thinking and Data analysis based on the Energy Atlas.

Service design thinking is focused on creating user-friendly services matching the needs of customers, and is about value sharing between stakeholders, whether it is financial value or other values like talent, space and marketing. "The sessions, with stakeholders having positions in the area as renters, owners, or as shop owners, service provider, housing corporation and other, resulted in 7 projects and resulted in connections forged between stakeholders in the area"(TRANSFORM, 2014a, p. 25). The specific projects mentioned are 'kitchen grinder' and 'LED public space', targeted at CO2 reduction. However none of these two are further elaborated on, are retraceable on the Internet, neither are they referred to in the interviews. The positive effects of these Design Thinking sessions are mentioned by many interviewees. Stakeholders have experienced this as the first opportunity to exchange ideas and get an overview of the situation in South East.

The second path involved the gathering of data and the analysis, bundling and presenting the data in the online Energy atlas, a decision model made in the Transform work package 3. The Energy Atlas got online on the 17th of April 2014 making the data available for other stakeholders to develop ideas. As a basis for understanding the problem and the possible solutions, data on energy production and consumption, presented in the Energy atlas, played a decisive role, according the transform documents: "Intensive stakeholder collaboration using data as an instrument to understand the problems and to set priorities" (TRANSFORM, 2014 #93). Next to prioritising, sharing the data made it possible to get new parties involved: "Data provided new insights and defined the specific challenges for Amsterdam South East. Also data enables all kinds of parties like consultancy, foreign experts, business partners and students to get active in the area" (TRANSFORM, 2014 #93).

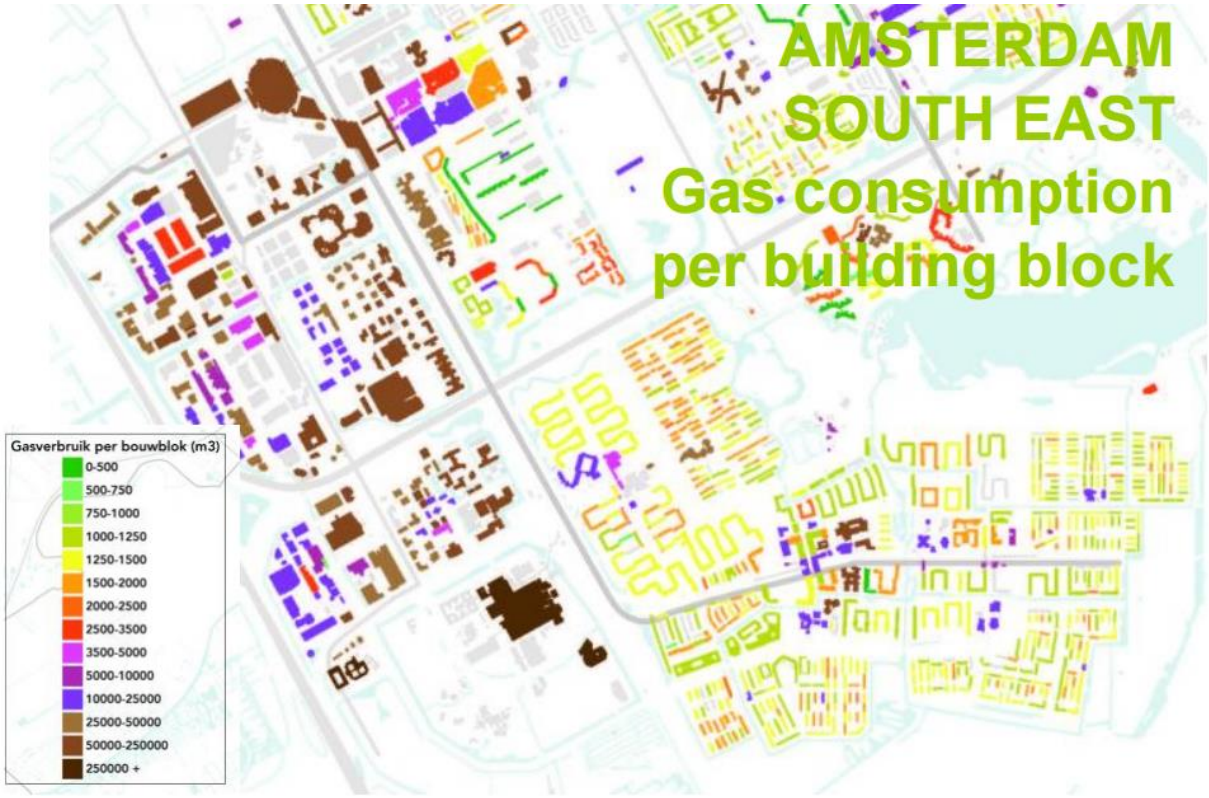


Fig. XX Bron example energy atlas gas consumption Amsterdam South East. http://www.intrepid-cost.eu/wp-content/uploads/2016/01/2016-04-21_INTREPID_Delft_Schremmer_01.pdf , p.7

The energy atlas shows the main gas consumers are the businesses (dark brown), while the housing areas are having low gas consumption (yellow). This justified the meaning to focus on companies rather than citizens.

3.2 Generate, select and organize project ideas to achieve your objectives

Most important in the SUL is the cooperation with the local stakeholders. Because the area is a built up area, the users and owners in the area can make the difference. Since the beginning of Transform the partners in the area started working together. *They created ideas and researched project proposals* (TRANSFORM, 2014a, p. 7).

From the beginning, companies like the ArenA soccer stadium, the AMC hospital and IKEA took initiatives from their own perspectives. They might not see the municipality as initiator, but they follow their own agendas and timelines. These organisations are responsible for a lot of separate projects in the area (TRANSFORM, 2014a, p.27).

To select viable idea's from the brainstormed results in the Design Thinking sessions, the Transform consortium suggested to organise Intensive Lab Sessions. The sessions were scheduled around three themes: sustainable heating and cooling, the role of the private sector in retrofitting and public action. The objective was "to bring in extra knowledge, accelerate, and ask prying questions" (TRANSFORM, 2014a, p.26):

"The ILS generated projects which are worked out in the SUL (e.g. solar gambling and waste heat of the hospital)" (TRANSFORM, 2014a, p.26). Solar Gambling is an application developed by the HvA to inform and convince the public about the advantages of solar energy. The use of waste heat of AMC seems to be under study and is also mentioned in the evaluation: "Key projects for impact on CO2 reduction are: using waste heat of the hospital, using local waste to generate (green) gas, retrofit of

ffice buildings and providing sustainable fuels by an Orange gas station" (TRANSFORM, 2014b, p.79-80). None of these projects have made it to implementation.

The positive effect of the ILS sessions is confirmed by most interviewees. The ILS was the basis for the setup of a programme with three themes as the basis, which developed over time: "During the second half of 2013 and 2014 the programme grew with new programmatic lines and new concept projects coming up and also ending" (TRANSFORM, 2014a, p.26)

Intensive Lab Session

On June 18, 19 and 20, 2013 the Transform Intensive Lab Sessions (ILS) were held in Amsterdam South-East. The Intensive Lab Session has been an essential intervention of TRANSFORM: "The session worked as a pressure cooker event to work towards an implementation Plan concerning the sustainability of the area. Local stakeholders and international experts work on the question: how to make Amsterdam South-East meet the European 202020 targets?"

The Amsterdam Intensive Lab Session focused on three 'themes' with direct or indirect impact on the main TRANSFORM key performance indicators:

- Reduction of CO2 emissions
- Reduction of energy demand
- Increase of local renewable energy production
- More efficient use of remaining fossil fuels.

Next to these indicators, the following values were included in the analysis: economic values (jobs, lower area settlement costs), social values (social interaction, lower energy bills, co-creation) and larger environmental values (noise, air quality, resource efficiency).

In the ILS key considerations are PESTLE: Political, economical, social, technological, legal, environmental, governance and spatial. "The existing PESTLE methodology is used and added with two topics relevant for (energy) planning: **Governance and Space**."

Some examples mentioned by Transform "Governance: stakeholders, citizen involvement, roles of governmental and private organisations, way of cooperation, use and sharing of data, planning."

Fig 7.4 Overview of Transform project ideas generated during the ILS in Amsterdam (bron:…)

During the project a roadmap was used to develop projects in determined steps. Each of the project ideas had to be validated to determine its feasibility. If the outcome was positive the next step was to develop a business case and to make sure some of the partners would profit from the business case and therefor give commitment to the development and needed investments. Most ideas stranded up here because there was no profitable business case. Positive outcomes would be framed in the strategy of the partners and should be ready to scale up starting in 2015. Unfortunately until now there has not been any project were up scaling could successfully be initiated! The current partnership is still researching ideas along this roadmap to find profitable projects.

Fig. 7.5 Roadmap projects from 'concept' to 'scale up'.

3.3 Ensure (financial) support to the projects

The leadership within Transform did not result in involvement of stakeholders at the executive level until a late stage, end 2014 at the Captains Dinner, were CEO's of involved Transform 'partners' underlined their commitment for the programme (i.e. long term sustainability goals). The result is therefore more important for the post-Transform period. This is expressed as a lesson learned in the evaluation: "Always engage both the operational and the CEO level, right from the start. This will optimize working procedures" (TRANSFORM, 2014a). F. de Leeuw states that in the current situation (after Transform): "These goals and commitment should be repeated more often in discussions about projects for the area" (F. de Leeuw from ArenA).

During the Captains Dinner held at the end 2014, only a limited group of partners made a commitment to global objectives for the period after Transform. It occurred too late in the project to result in concrete objectives and projects. To create **effective partnerships** it is also necessary to work towards shared goals.

> "The incorporation of a project in the stakeholder organizations is not stimulated by the external funding. The project will run on the investment of policy makers and stay outside the daily operations. The executive managers should determine up front what they think is important, to make clear it will also be supported after the external funding has ended" (G. den Boogert from the Municipality).

Transform provided the needed extra financial means to be able to test solutions in practice. Also Transform brought external expertise, created a sense of urgency, brought in knowledge and widened up the scope of possibilities. "Being part of a European programme legitimates the actions in the SUL" (TRANSFORM, 2014a, p.62).

The Climate and Energy office taking the lead in Transform did not bring in any financial support, other than the input of their human resources. The instruments were all about facilitating in a positive way without legal enforcement.

> The energy has been mostly directed on informing and connecting to foster cooperation and start up new markets (precompetitive procurement). The Climate and Energy office has no resources to invest other than the Amsterdam Investment funds of 60 million for which projects can apply and compete. The climate and energy office and all other partners contribute in kind to support the project management. Each of the projects is funded individually by the partners concerned. However through the Amsterdam Funds the city is able to support projects throughout the city in the first phase of the development with loans, guarantees and shares (TRANSFORM 2014a, p.28).

A known example of a successful project, during the Transform project (however not directly produced by Transform, but by Amsterdam ArenA and their green deal partners) is the development in 2014 of a large solar panel roof of more than 4000 panels to reduce the dependency of fossil fuel for electricity. The business case was made possible by participation of the Amsterdam climate and energy fund (AKEF), the Amsterdam investment fund (Letaifa) and the fund for the stimulation of sustainable Energy production (SDE) from the national government. The aligning of the different funding policies of different government bodies made the business case enforceable The installation of the rooftop solar system will cost approximately 1.6 million euros and will be executed by a number of Green Deal partners of the ArenA: Nuon, BAM and Arcadis. Oskomera is in charge of supplying and mounting the photovoltaic panels. The Green Deal partners support the ArenA in their efforts to achieve net climate neutrality by 2015. (Amsterdam Arena, 2015).

No other projects were found for which the financial support could be arranged in the context of Transform. "Several business cases are developed which give deeply insight in the feasibility of projects/ideas. Coming to this point of development gives the sense of realism of projects and also contours of the needed investments. Also it creates a feedback loop to parties to set priorities, based on impact and finance" (TRANSFORM 2014a, p.60).

3.4 Implement the projects

This sub-phase of Mora does not fit well with the objectives of the Transform project, since executing the implementation plans should start after Transform was ended. Although Amsterdam took the position to execute projects parallel to the development of the IP, "in practice project ideas were researched but not actually implemented" according to den Boogert from the municipality. However

some project ideas were tested and feasibility research was done to prepare the implementation plan.

During Transform on the municipal website is communicated about expected transitions: “In the South-East area, several project ideas are in different stages of development: among them a proposal to re-use the warmth generated by datacentres, to switch to LED light technology, and the AMC Medical Centre may place solar panels on its roofs.”(Amsterdam Smart City, 2014).

However none of these projects have been implemented. Here are some examples, with further details on why the implementation has failed.

The Lighthouse IKEA

The project idea was to make a showcase within the IKEA store in South East of a sustainable house equipped with solar panels, insulation and IKEAS’s sustainable products, and a normal house without energy saving measures and basic products visualizing the reduction of energy usage and financial benefits to create public awareness. The grid company Liander was involved to promote their SMART meter and SMART behaviour. “The reason the project stopped was that the management team of IKEA is very reticent in cooperating with other organisations. In their view there is a risk of confusion of brands, and the brand of IKEA should not be ‘contaminated’”. Mainly due to this project a lesson learnt is that it is “very important to do a check with the higher management on feasibility of the project. In cooperating with different organisations: all parties should invest in the cooperation from the beginning on”(TRANSFORM, 2014a, p.34). Unfortunately from Ikea no one was available to give feedback on the project.

Datacentre

The project with waste heat from the Datacentre, has been cancelled. After an expert research, including a second opinion, it turned out that the using of waste heat of the datacentre does not make for a solid business case. It is technical only possible to use this waste heat in close proximity. For current businesses surrounding the datacentre heat pumps would be a better alternative.

AMC-Arena energy supply

The business case analysis done by the Technical university of Twente and a consultancy firm. Project proved not feasible.

Solar gambling

The project planned involving students from the HvA to start a programme for citizen participation, but the right contacts left, and the right course was not available (G. den Boogert from the municipality).

Orange gas station

No location could be found for the gas station.

A general advice from the Transform team for the implementation of projects based in this experience is that “Because every area is different, there is no such thing as the golden roadmap to come to an Implementation Plan. Tailor-made solutions have to be the norm” (TRANSFORM, 2014b, p.32).

Analysis Governance development phase

Most project ideas fall in an unsuccessful business case, or don’t even make it towards this . The solar panels on the ArenA are a positive exception, but only because three governmental funds have

contributed to the funding. I conclude that constructing a sound financial basis for projects is still one of the major bottlenecks. The Energy Atlas of Amsterdam is a result from Transform and can be found on the internet. It is available for other initiatives in Amsterdam for example from the ASC-platform. No proof can be found that the atlas is re-used by the other Transform partners or any other city.

Why different projects are mentioned in the Implementation Plan as key project for impact on CO2 reduction is unclear. It is not stated how much CO2 reduction will be realized by each project. Neither are the projects realized nor can any further information be found on the internet. Often it are idea's that have come up and didn't make it. For example the Orange green gas station was realized in the port of Amsterdam in December 2012, so the idea was probably to repeat this in the SUL, which did not happen until now.

The important role of open data in Transform to support the decision making and develop business cases, confirms that the use of open data as a governance factor really supports the collaboration and stimulates participation in Smart City development. However, this is what the formal reports tells us. In an interview one interviewee states that the Energy Atlas, still is not sufficient enough to base decisions on.

7.4 Monitoring and evaluation

Monitoring and evaluation go mostly hand in hand. The data collected by monitoring are compared with set objectives for a task or product (evaluated) and the concluded deviations lead to additional actions if necessary. I interpret Mora's division as: 'monitoring' focussing on evaluation during the process to adjust and 'evaluation' concluding to the worth of the realised results.

4.1 Monitor progress and evaluate results

Monitor progress

There have been different phases of monitoring during the Transform project. After the first year of Transform, in December 2013, the first document got published on the progress of the Smart Urban Labs by Mantel & den Boogert. Most information is deducted from the final reports on Transform in 2014 concerning the evaluation.

According to Mantel & den Boogert (2013, p.18) there were a few key challenges to implementation, experienced in all cities. I have added the relating governance factor between brackets. The focus is on the complexity of the energy domain and therefor the struggle to find solutions that could be realised in collaboration.

- Accessibility of detailed energy and other data to all stakeholders, in order to facilitate dialogue and building business cases (Communication issue, related to Open Data)
- Expertise to facilitate collaboration to improve existing collaborations and to align the agendas of residents, companies and the public sector (Collaboration issue)
- Finding solutions for sustainable district heating systems, with a focus on additional renewable sources, the use of waste heat, the need for infrastructural investments and the tension between public and private interests (Collaboration issue)
- Devise feasible models (of governance) for investment, applicable under existing regulation, which are interesting for banks and other financial institutions or companies (Governance issue, also related to legal, financial aspects)
- Legal framework for energy co-operatives (Partnership issue)
- Organizing commitment to implement (Leadership and Partnership issue).

In this publication the Amsterdam Climate Office noticed that there were no surprises encountered in this first stadium of the project, meaning that the above mentioned challenges were known up front. They signal three main reasons why the future project outcome might still be different from the objectives: 1) The abatement curve [cost curve for greenhouse reduction], meaning solutions are often developed without a demand from the public, or with no clear connection to any issues which the public feels are important; 2) The energy chain is undergoing changes (new players, including end users, are entering the market; and new markets are emerging; 3) Often the goal of reducing CO2 or saving energy does not appeal to stakeholders such as local businesses and households. Other values and storylines are needed to motivate people to change (Mantel & den Boogert, 2013, p. 18).

In their conclusion Mantel and den Boogert state the importance of intrinsic motivation as a sound basis for collaboration and see a relation to the leadership process:

> Clearly, the key to success in the smart urban labs appears to be the ability to work together; to find intrinsic drivers for change or the willingness to reach out across organizational boundaries. This requires a form of story sharing which incorporates value and service design thinking, as well as good leadership. (Mantel & den Boogert, 2013, p. 21)

Based on this focus on collaboration, in the synthesis report of the Transform team the SUL approach is qualified as 'very successful', because it helped cities to start and intensify discussing energy planning within the administration and with stakeholders. "The SUL works as a platform and the method of ILS is a way to accelerate the collaboration between cities and key stakeholders in the area" (TRANSFORM, 2014b, p. 10).

However, Transform also mentions that a pure local strategy might not be ideal for an energy strategy:

> It is necessary to consider the overall systems linkages and energy flows in a city. Including an overall system logic, however, may lead to different strategies and results of optimization: Energy systems that are considered optimal within the boundaries of a SUL may not look so ideal when considering the entire energy system of the city or even beyond.(TRANSFORM, 2014b, p. 27).

In this synthesis report 'good governance' is stated as 'the secret to success':

> By starting a development process governance issues will immediately come to the fore: Integrating energy planning, urban development, housing and economic development as well as infrastructure planning in an innovative way is a highly demanding task, which goes far beyond business as usual on both levels, political and administrative**.** (TRANSFORM, 2014b, p34)

Evaluate results

The interviewees see a relation between the composition of the **core team and the final results** of the project. "I think it would be wise also to **invest on the management level in the collaboratio**n" (M. Maris, from AMC). No one is really made accountable in this situation, if each stakeholder performs some actions. The implementation gets a fairly ad hoc character" (G. den Boogert from the Municipality). "People who were responsible in the cities were policy makers, not people who translate policy to implementation" (International Coordinator R. van Warmerdam). "Partner AMC was reserved because of the possible risks and a very late involvement of the Board, that's why its investment remained uncertain for a very long time. It remained a toy for the policy makers for too long, and they had an unclear mandate. The result is an unclear vision at the level of the board" (G. den Boogert from the Municipality).

In line with European strategy, Transform has been mentioned by the municipality as “one of the main projects and actions in Amsterdam achieved in 2013” (Gemeente Amsterdam, 2013).

However, the statement prior Transform by Baron "Everybody agreed on having ambitious climate goals, and there were loads of ambitious intentions by the city, but nothing too much happened actually" (Baron, 2012, p.2). Also seems quite relevant in this case.

Based on the success indicators of the European Commission, mentioned earlier,Transform, was ‘smart’ (it included a significant role for ICT enablers), however within this Workpackage 4 the role of ICT was on the background in the form of an energy atlas. It was not contributing effectively to achievement of EU 2020 targets, it was not innovative, however it did NOT offer (sufficient information to assess its success).

On a European level “Platform members have indicated the important role that projects such as ‘Transform’ can play in providing a space for cities and other stakeholders to experiment” (Smart Cities and Communities, 2013).

In the Transform project evaluation afterwards, some critical remarks are made concerning the followed strategy. “The strategy was to let thousands flowers blossom. Sometimes it would have been better to test at an early stage whether the big bosses of possible partners were enthusiastic or not” (TRANSFORM, 2014a). This is also expressed by some interviewees who explain the lack of concrete results by a lack of agreed measurable targets. “No hard targets up front”(ArenA), “The core question ‘what’s in it for us’ is often repeated. Apparently the objectives were not clear enough. All communication and all collaboration is heavily influenced by this question” (I. Wenzler from Accenture). “Targets should be determined at executive level by the partners and agreed upon at the beginning. Otherwise there is a risk on ineffective behaviour provoked by the external funding” (G. den Boogert from the Municipality). “Discuss upfront with stakeholders what the collaboration could mean for them, to determine offer and demand and the shared values to build upon” (M. Maris from AMC).

The positive effect of open data and the lack of knowledge on available technologies are the most significant findings of the team:

> The Amsterdam case of building intensively on motivation and empowerment of stakeholders to engage in the urban development process shows that: using data and information may considerably support the willingness of actors to engage; and lacking knowledge of stakeholders on available technologies and how they can act in the field of smart urban development is a major barrier to implementation. (TRANSFORM, 2014b, p. 59)

The conclusion is that “Since smart urban development and the transition towards a smart district is not a part of the daily work of major local stakeholders, support for implementation is needed. It takes a lot of persuading, personal resources and time to innovate and knowledge how to come from an idea to an investment decision”(TRANSFORM, 2014b, p. 59). Thus the right people need to be involved.

Success factors mentioned by the climate office are the existence of the ASC network, and the partners that delivered data for the Energy atlas.

> The energy atlas was the underlying knowledge base to stimulate people to think about sustainability and hinted at possible solutions. This collaboration has shown to be a success factor for the energy atlas, but not so much for other projects. The energy atlas forms an

> important basis for monitoring within the entire city of Amsterdam.(TRANSFORM, 2014b, p. 33)

The major result of Transform for Amsterdam is the awareness and willingness among stakeholders to continue the collaboration in the SUL. Regarding the Amsterdam Southeast vision, the involved stakeholders agreed that:

> The SUL Amsterdam, Energiek Zuid Oost, is an area for experimentation, learning and becoming more sustainable. A public-private partnership forms the basis of transformation. Stakeholders support the transition towards new economic concepts like the circular and smart economy. They are aware that collaboration is the way to success and govern (and pay for) the local development (TRANSFORM, 2014b, p. 73).

Mainly due to this new public private partnership "The Amsterdam Transform team is very happy with the achievements that were made in the SUL during the Transform period… and signed to contribute to these goals in the coming years"(TRANSFORM, 2014b, p.32).

> The methodology to start in the area and bundle existing enthusiasm and projects was of crucial importance**.** There were already good relationship with some of the major stakeholders in the area, like the ArenA stadium. Without the enthusiasm of the ArenA and the involvement of NUON and AMC and others *this* would not have been possible. To make an innovative transformation plan in a specific area, it is necessary to have strong and committed actors in the area itself. These partners can more easily reach and stimulate other organisations in the area.(TRANSFORM, 2014a, p.33)

In retrospect, the municipality concludes from the SUL experience that:

> it is highly relevant to integrate the overall, city-wide perspective in the planning and decision-making on the energy strategy for individual urban quarters. While the area-focused planning approach is recommended, it is necessary to include city-wide system information and framework conditions in the local area's planning processes. This relates e.g. to the energy mix (energy carriers) and thus to "indirect" emissions outside of the area, or to overall development of capacities in the system of district heating networks, etc.(TRANSFORM, 2014b, p. 27).

The Transform results were described in the roadmap for developing an IP and are afterwards compared with reality. There is quiet a gap between the objectives and the results as showed in the next table

City	Function of the IP within the city development – ex ante (source D4.1)	Experiences – ex post
Amsterdam	The IP is a visionary framework to speed up a multiplicity of existing and planned transformative projects, and thereby link local needs with key themes and considerations of the city's transformation agenda. The products of the implementation plan should have added value for (a) implementation speed-up, (b) creation of buzz in South East to attract new initiatives, (c) learning factor for other areas in Amsterdam and (d) learning factor for other cities.	The making of the IP resulted in (1) a knowledge base regarding energy (2) the creation and testing of project ideas (3) creation of a buzz in the area (4) The application of a programme manager that will work on behalf of the city, ArenA stadium and other main stakeholders in the area.

Table 7.1 Comparison of IPs' function as expected (ex ante) and in practice (ex post). (TRANSFORM, 2014b, p.58).

This gap is also mentioned in an interview with G. den Boogert "if you judge from the perspective of which projects realised a reduction of theCO2emission, you get the short end, but if you judge from the milder perspective of EU-subsidised projects to create a foundation, then it was successful."

The Transform documents are not detailed on fail factors regarding the making of the implementing plan, or actually implementing projects, stating "reasons varied". Other unexplained fail factors are: "no business case and uncertainty about future developments" (TRANSFORM, 2014a, p.33) pointing at the insecurity of a business case being valid after the EU funding has ended. Lastly, two barriers for implementation are mentioned in a table in the reflection chapter: "local land use plan" and "possibly: waste treatment legislation", without further explanation.

According to some interviewees the planning was sub-optimal. The European funding does not contribute to an optimal anchor in the stakeholder organizations, "in some way it even hinders this because stakeholders are not financial responsible" (R. van Warmerdam). "More activities are done parallel than would be optimal for the planned progress, with a lack of consistency between the separate activities" (I. Wenzler from Accenture). Continuity, up scaling and or maintenance of solutions after the Transform project timelines are problematic, because then external funding is no longer available. This is enforced by a lack of knowledge with the local stakeholders on how they can act in the very complex field of Smart (energy) Districts. On the meta-level of cooperating European cities it is very difficult to collaborate and make use of local developed knowledge.

4.2 Adjust and modify

This phase in Mora's description model concerns the adjustments to continue the SUL activities after Transform under new conditions and with new possibilities. In Amsterdam the key stakeholders of 'Energiek' Southeast founded a new organization (Southeast/ ZO Circular). In this public private partnership, partners invest through human resources and by financial contribution. After Transform, the management for this organization will be in hands of TNO a knowledge institution. Management fees are funded by the partners in order to set up new initiatives, monitor current projects, manage finance and marketing. More focus will lie on learning, communicating and evaluating:

> By involving a knowledge institution [The Amsterdam University of Applied Sciences and TNO] in the programme of Southeast Circular, learning shall be fostered. The aim is learning from own experiences and from initiatives and techniques from other places and

> communicating these results to others. By regularly evaluating the projects and administrating, it will become clear and explicit what the realized projects are able to contribute to the objectives. (TRANSFORM, 2014b, p.88)

The wording underlines that the partners are aware of the modest results of Transform and make their best intentions to improve their way of working in the near future. Even on this result are different perspectives among the stakeholders. “Although there is a follow up activity initiated, there still is no shared agenda with clear goals, actions, monitoring, financing etc., so no implementation plan”(G. den Boogert from the Municipality).

Stabilizing the status quo between the stakeholders in the continuing activities post-Transform can have an inhibitory effect on the innovation activities. The Transform team is aware of that and warns for this possible effect:

> After the setting up of the network the leadership role in the coming period will be less clear. With partners who have a strong position within the area, less urgency might be felt for new and innovative solutions. Therefore it will be the role of the city and the knowledge partners to stay alert and to foster openness, learning and experiments (TRANSFORM, 2014b, p. 82).

For next steps in implementing future Smart City initiatives as follow up a number requisites are formulated:

- overall objectives (on the city level, but broken down to quarter level),
- innovative strategy development (relating to energy, urban development and mobility) and
- defining measures which include both, framework conditions (legal, institutional, economic) and direct interventions (through projects and processes). (TRANSFORM, 2014b, p. 12)

In order to live up to the above mentioned requirements cities need to redesign their governance systems. With the focus on main governance factors like “institution building, open knowledge and data provision, smart/sustainable city guidelines and targets, framework conditions, and binding agreements” (TRANSFORM, 2014b, p.12). On an international scale data exchange was a difficult challenge: “It is not easy to induce commercial stakeholders to open data” (I. Wenzler from Accenture).

“A managing client to steer on the realization of targets was missing“ (International Coordinator R. van Warmerdam). Also the municipal leadership was at times missing due to an instable political mandate for Transform by municipal representatives. Therefore, an intervention (11th November D-Day meeting) from the general coordinator was needed to improve the involvement of the different cities including Amsterdam, in which the director of spatial planning (DRO) has been involved to show commitment, and finally let the MoU sign by the Mayor of Amsterdam/ Alderman of Sustainability (Choho).

On international level one of the Transform results is a signed Memory of Understanding (MOU) between the participating cities containing 11 statements on their future intentions based on the Transform experience. In the view of the coordinator much of the Transform results are presented in a format to please the EU, suggesting more result than factual realised: “The MOU of Transform is more a political statement with undefined results and more based on wishful thinking. It all remains vaguely, perhaps because nobody wants to burn his hands” (R. van Warmerdam). His warning for future projects is: “the plead for holistic view in the research literature and EU-vision documents is

too complicated to execute in reality. 'Keep it simple', and focus on key projects, is the best guarantee for success" (R. van Warmerdam).

From the Transform experience 'power modelling' or 'stakeholder mapping', a quick scan of the legal situation and of the major stakeholders) is advised as a first step in starting a SUL: "This will deliver the insight of a necessary mandate and on the willingness to collaborate on the set vision. Such a process involves to overcome conflicting interests and finding a joint way for developing quarter"(TRANSFORM, 2014b, p.35). When transforming an existing area, the legal framework to change the context is often very limited. Therefore "In order to transform, the commitment of all the asset owners is needed" (TRANSFORM, 2014b, p.14). Thus the focus should lie on a circular process in which stakeholder management creates a joint vision and approach, in which business cases are tested and developed in relation to this development approach, and adjusted where necessary.

Conclusion Governance monitoring/evaluation phase

The three challenges signalled by Mantel & den Boogert in 2013 (the abatement curve, the changing energy chain and the appeal to stakeholders) have not been fully tackled during Transform which resulted in an Implementation Plan far less concrete then planned for at the start of Transform. A clear roadmap of scaling up is lacking in the Implementation Plan, but the focus on participatory models has stayed.

The above table 7.1 on Transform objectives and results shows that the first ex ante statement (a) 'implementation speed-up' , hasn't been experienced ex post, although it might be in the creation and testing of project ideas.

The Transform-team signalled relevant governance factors (institution building, open knowledge and data provision, smart/sustainable city guidelines and targets, framework conditions, and binding agreements) for future developments are in line with the governance factors mentioned in this thesis, however missing key aspects like leadership and participation. This is in line with their conclusion that 'governance is the key to success'. A definition for governance is not given in the Transform documents, but it is clear that they focus on organizational aspects, excluding for example vision, objectives, steps to be taken, responsibilities as other aspects from a roadmap, beside governance (TRANSFORM, 2014b, p. 54).

Some points remain unclear during the project execution, for example how the city alderman tested the plans. In the evaluation afterwards is concluded that the lack of knowledge with the local stakeholders on how they can act in the field of Smart (energy) Districts, what technologies are available, what is the effect, how to come from an idea to an investment decision in this field of work, etc. is a relevant barrier for these kind of initiatives. Stakeholders have learned a lot about this domain but the learning effect in some aspects replaces the targeted results c.q. concrete committed implementation plans for specific projects.

The evaluation report gives credits for the success to the private parties, while in reality this 'success' stays rather vague. A specific mentioned examples is that thanks to the Amsterdam Arena "an appealing result in the area during the Transform period was the covering of the roof of the Amsterdam ArenA with solar panels" (TRANSFORM, 2014a, p.32). I already noted that this ArenA project result is not a result from Transform it would have been realized because of the entrepreneurship and innovative spirit in order to achieve high ambition to be CO2 neutral.

The reflection of the Implementation Plan gives an overview on 'best practice for implementation'. The business cases of different projects (local waste heat, for solar for big consumers, for locals waste to energy, and for demand supply management) are defined as 'best practices' besides the funding by Amsterdam investment fund for solar on ArenA and the orange gas station. How these

business cases are developed hasn't been clarified nor are there references to other documentation. A 'best practice' is a technique, methodology or activity that has proven itself to be more effective as any alternative. To be available for other 'users' it should be very well documented. Since no references are given it seems that these 'best practices' are not accessible. I find the conclusions of the project team in this way unsatisfactory and unverifiable.

7.5 Communication

For communication within Transform was no specific technical platform available. Communication was focussing on the creation of 'Buddy cities' and the organization of master classes to share knowledge and experience. However this was a separate track within Transform, work package 5 coordinated by the Genoa team, and out of scope for this case analysis.

5.1 Communicate and promote the smart city strategy

On European level Transform had its own website where their documentation was made widely available (http://urbantransform.eu/). A special glossary was developed to define a shared language with concepts and definitions and to avoid misunderstanding.

Meetings were scheduled every two month, on a to low frequency according to the international coordinator "If you meet each other every two months, the collaboration remains superficially. That's why we suggested to limit the collaboration from 6 to 3 cities, so people could put more effort and time in real international collaboration" (International Coordinator R. van Warmerdam).

On a local scale, meetings with the municipal project team were scheduled on a weekly basis. However these meetings did not include all the necessary stakeholders in the area, and was more focused at delivering the overall Transform objectives. These meetings were not well documented or going according to a strict checklist of plans, actions and follow up checks. The meetings were often done as an 'update on the process'

Also on other platforms like ASC information on Transform was and still is published (https://amsterdamsmartcity.com/projects/transform). This platform is for Amsterdam of greater importance than the Transform platform.

Den Boogert mentions that to better anchor the Transform project within the municipality, "we could have communicated about Transform internally more often and involved our colleagues at the different departments more often, we didn't have a monthly meeting scheduled for the department". He continues, saying that communication within the area has happened very intense, but internally within the municipality this process could be improved. For example, the climate office did publish an update of the project in their municipal magazine 'Plan Amsterdam', however this is often used to describe finalized projects and results.

Analysis Governance communication

Communication played an important part in the area, especially during events like the ILS, and the design thinking sessions all stakeholders communicated with each other, and this governance process intensified. However internally within the municipality, and within certain organisations, like AMC and Ikea, the Transform goals could have been communicated better.

7.6 Conclusion on governance success factors and barriers

During the five interviews, the interviewees made 141 statements on the governance factors. Most of the attention is drawn to the first two factors (Collaboration and Leadership) with less priority for

the third (Participation & Partnership). The presence of the other factors are less dominant. The interviewees confirmed – sometimes very explicit – that the eight factors are presented in order of importance.

The interviewees look back on the Transform project with a balanced mix of signalized success and fail factors. Since the project is already terminated some time ago, they have taken some distance of the work and find it relative easy to give their opinion on success and fail factors. I find it remarkable that, although Amsterdam has received positive international attention for their approach and results, the interviewees are on the whole not that positive about the results of Transform. The most positive effect is seen on a process level, in the fact that involved parties continue to work together on other initiatives in the same area after the Transform project was terminated. The lack of positive effect is seen on the product level in the omission of the concrete implementation plans (or executed projects), based on a shared agenda and timeline. This critical retrospective of the interviewees is quite different from the general appreciation for Amsterdam in the literature on Smart Cities; perhaps this is caused by the results and image of the more generic Amsterdam Smart City (ASC) Platform. Publications often makes no clear distinction between the Transform project and ASC.

Interviewees are critical towards the end results, referring to almost twice as many barriers as success factors. Especially in the factors Collaboration and Leadership & Champion the scores are dominated by the barriers. Accountability and transparency are more issues for the international coordinator as for the local participants. The next table shows the spread of spontaneous presented success factors and barriers over the different governance factors. Some statements are qualified as 'factual' meaning that there was no clear designation to the other categories.

	Governance aspect/ nr statemen	Transform	%	SF's	Factual	Barriers
1	Collaboration	45	32	13	4	28
2	Leadership & champion	43	30	12	1	30
3	Participation & Partnership	24	17	13	3	8
4	Communication	4	3	4	0	0
5	Data-exchange	10	7	5	2	3
6	Service & application integration	2	1	1	0	1
7	Accountability	8	6	0	1	7
8	Transparency	5	4	1	0	4
	total statements	141	100	49	11	81

Table 7.2 Division of statements from the interviews

The collaboration is built upon the selection by the municipality of larger organisations, being active in the SUL-area often already participating in the ASC-platform. The side effect is that most smaller local companies were not involved from the start. Collaboration is based on the awareness that partners need each other to solve complex energy issues in the area. While the European tender calls for concrete implementation plans and reusable knowledge, data, models and procedures the stakeholders in Amsterdam agreed to focus on a sustainable platform for long term development. Since Smart City initiatives are mostly long term developments, the advice is to select partners with strong commitment, active in the area with a long term perspective and an image that is partly depending on the area.

Leadership is shown by the city by taking the initiative, addressing stakeholders and creating a SUL. This active leadership, driven by high ambitions and a chance for EU funding, gave Amsterdam a coordinating role in Transform. The leadership is realised in a facilitating mode, since the city really needs the stakeholders to realise transitions. The leadership within the stakeholder group is

somewhat diffuse, inherent to the chosen strategy to develop a kind of 'own responsibility' among all stakeholders.

Participation of citizens is in fact not realised since there are not many inhabitants of the area. Some participation of small size firms is initiated in a later stage.

Partnership is strived for from the beginning in a rather informal platform, thus referring more to collaboration. Some major players are constant (municipality, ArenA, AMC, Liander and later NUON) but many names come and go in the diversity of publications which makes the 'partnership' unclear with a diffusing effect on accountability and transparency. This approach seems to be chosen by the municipality as a strategy to avoid central leadership and responsibilities and to stimulate others to take up responsibilities with the adjacent funding. The format of the Captain's dinner to speak out commitment on executive level is appropriate, but it would be better to arrange this in the first phase of the collaboration, to underpin collective ambitions and objectives.

The partnership on the international level was built as a consortium, but only for the durance of the Transform project.

In this Smart City initiative service or application integration is not an issue or an opportunity since there were no concrete solutions implemented.

Accountability and Transparency were not given the attention needed to create clearness on the partnership. "If you all perform a little bit of the action, nobody is really responsible for the result and the work becomes quite ad hoc organized" and "The executives should state at the start what is important and what not, so it can still be supported whenever the subsidy is ended"(G. den Boogert from the Municipality). "If the project-cooperation is not part of each executives personal targets they will never be made accountable" (M. Maris from AMC).

Transparency in relation to the 'developed projects' is lacking. The project descriptions are mostly somewhat vague, responsibilities unclear and so is their final status. Most projects are limited to the stage of idea-concept, leaving unclear why the idea is not (yet) realized. It shows that constructing a sound financial business case is still a major bottleneck. Transparency factors are only mentioned by the central coordinator and the municipality. The focus is on encountered barriers, mainly on quality assurance aspects: "Quality is an issue here. The cities involved were the only parties to decide about the quality level of their results. Quality check should be done independent with possible sanctions in case of a clear lack of quality. Just very view people are asking the question "why is it that we don't realize our objectives?" and are trying to understand this" (International Coordinator R. van Warmerdam).

8 Case Triangulum

What governance sub-factors have been used to stimulate the implementation of European funded Smart City initiatives in Eindhoven?

8.1 Starting

2.0 Starting Phase

2.1 Grow up the idea to become smart

The former mayor of Eindhoven, Rob van Gijzel, has been actively involved in developing the Smart Society from the beginning. Eindhoven has the local culture of research and experimentation, related to the founding of the Philips factories and the former world famous Philips NatLab. Currently it's the high tech region of the country with the only high tech campus, promoting itself as 'the smartest km2 in the Netherlands' with a focus on open innovation. There is an active citizenship and a positive attitude towards experimentation. In 2011 Brainport region Eindhoven won the challenge for smartest region in the world (J. Brouwers, 2016). This title gave an enormous boost to the city of Eindhoven, attracting businesses and people towards the city, and can be seen as a start towards becoming a Smart City.

On the first of June in 2015, The New Institute and the municipality of Eindhoven have announced and started a new cultural programme for the period of 2015-2017, on the changing relation between citizens and the government. Here, the city of Eindhoven announced it would like to become a Smart, healthy, caring, innovative and adaptive city (B. Brouwers, 2015a).

2.2 Define the motivation and take the leadership

Motivation

The city of Eindhoven has strong commitment towards its citizens to enhance the quality of life, by mobilizing the creative power of triple helix parties and citizens (quadruple helix) all together. It is also opening the city itself as a real life testing ground for products and services. As the mayor states "We should strive towards more smart solutions which connect all sorts of activities, like entrepreneurialism, mobility, health, and energy. Only then we can reach a higher goal through the concept of the Smart City, like for example a Smart Society" (Van Gijzel, 2016).

In the budget of Eindhoven of 2016 is mentioned that their vertical hierarchical systems of organising city transitions is not functioning anymore in this changing society. Therefore the city wants to use living labs and focus on co-creative collaboration, to discover how these new ways of working are paying off in practice. In their coalition agreement they speak of the development from city towards a Smart City, or Smart Society, looking at digital developments in society and making optimal usage of the force of technology and ICT, and design thinking, so ICT can contribute to the energy neutrality and quality of life in the city. In this the changing role of the government in a 'horizontal' network society, asks for this different approach in the municipal organisation. This accounts for the people working at the municipality, but also for the internal systems, processes and structures to become more flexible (Eindhoven, 2015, p. 10).

Take the Leadership

According to Van Oers, executive vice president at KPN, the municipality of Eindhoven, and the mayor in particular, is the driving force in becoming Smart (Daalhof, 2016). Since 2008, the mayor of Eindhoven has been profiling Eindhoven as the Brainport, Tech City, and lately also as a Smart

Society. The vision is focused on building a Smart Society, so a long term approach for the soft infrastructure in the city enforcing bottom-up developments.

The city of Eindhoven states:

> We want the city and its citizens to benefit from our companies' developments. In order to be a living lab, we have to experiment, research and develop new ways of working and collaborating. It will not success straight away, and investment are made upfront the benefits. To realise these ambitions in the current coalition period €0,6 million euros have been reserved for 2016. (Eindhoven, 2015, p. 16)

This leadership role is internationally recognised at the CIO CITY congress in Amsterdam of this year, where Van Gijzel earned the title 'European Digital Leader' for promoting Eindhoven as one of the best Smart Cities of the world (Unknown, 2016a).

Local leadership: Park Strijp Beheer (PSB) in Strijp-S

As many interviewees stated, prior to the Triangulum project a long trajectory preceded of pushing the Smart Agenda, and developing an infrastructure in Strijp-S. Park Strijp Beheer (PSB) existed for years and worked as an engine to keep the community going. Already a state of the art data-net has been built, and Smart City knowledge has been gathered in a yearlong collaboration with Cisco and TU Eindhoven.

There have been plans for redeveloping Strijp-S, ever since Philips Electronics sold the site to Park Strijp Beheer (PSB), a public private partnership (PPP) between construction company VolkerWessels and the Eindhoven Council, in 2002. An urban plan was developed and approved by the City Council in 2005, to accommodate the growth of companies in the area by renovation and new building production, including the creation of at least 2,500 new homes, space for small-scale business activities as well as leisure and cultural activities. The development strategy was to give the area a new identity as a 'creative city' actively fostering an atmosphere of cultural innovation and creative entrepreneurship.

Strijp-S shows to be innovative in collaboration for a number of projects, exploiting ICT and new lighting solutions, making it a location for experimentation (Mol, Khan, Aalders, & Schouten, 2015, p. 54). Some critical notes to the situation in Strijp-S are "that it is currently difficult to get advice on the type of services that should be developed next. No market party is giving advice that is free of a clearly identifiable self-interest" and that Strijp-S is simply too small: "Development now seems to freeze at isolated showcases. When the scale of Smart City efforts is increased, at least the city centre should be included" (Mol et al., 2015, p. 69).

Eckart Vaartbroek

In 2012, The Dutch ministry of Infrastructure and Environment together with Woonbedrijf, the main housing association in the area, researched the meaning of Smart Cities. The central question was "How can technology improve issues in the area?". Their answer was "by connecting bottom up and top down initiatives into a customized approach" (Unknown, 2012b). They found that an important addition of the Smart Cities-thinking was that apart from existing sectoral and technology driven initiatives, the urban and spatial side needs to be included. By looking at the area it will become possible to look for cross sectorial, integral solutions matching local tasks and organisations (Eindhoven, 2014).

In Eckart Vaartbroek the city of Eindhoven makes the choice for a bottom up approach, starting at the individual. All kinds of participation is encountered. For example for Eckart in 2012 a covenant

was signed using the slogan 'Citizens to move'. In Eckart project success is heavily depending on the right participation.

Woonbedrijf has assigned itself the task to make the urban area of Eckart Vaartbroek future proof. Woonbedrijf sees a transformation process with a steering role for the residents. Physically, in the form of renovation and redevelopment, as well as in the form of mental ownership. Therefore the housing association has reserved € 59,5 million euros for large maintenance and renovation of the existing building stock of 1306 single family dwellings in the period of 2014-2023. Furthermore Woonbedrijf has set aside about 100.000 euros from the yearly budget, to stimulate initiatives for ownership and coherence. They think this can reap societal as well as financial profits (Eindhoven, 2014).

2.3 Identify the department responsible for the development of the strategy and form a planning team

Smart City Board

The city of Eindhoven has installed a Smart City board in which all the important sectors are represented. Against problems of silos Eindhoven makes use of integral urban area development in which all sectors come together to discuss and plan an area in the city. This board contains the most important managers of the city, who are in some way involved with the Smart City concept and is having monthly meetings. This started 1.5 years ago, first with informing, sending information, and creating awareness, but is now also creating commitment (Beijnsberger, 2016).

A critical note regarding Strategy and management in Eindhoven is mentioned in the 'Smart Impact Baseline report' (2015). This report lead by the Manchester City Council and Fraunhofer institute – currently partners in the Triangulum project - mentions several challenges among which:

> A lack of knowledge on the availability of smart solutions and their potential benefits has a significant impact on strategy. An unclear picture of own benefits leads to unclear priorities and often also unclear targets with respect to smart solutions. Eindhoven needs to improve its strategic grip on smart solutions, coming to an integrated management of urban development and maintenance processes based on clean and connected technologies, which is based on clear objectives and cross-sectorial management. (Duncan, 2016, p. 88)

In this same paper is mentioned that "Eindhoven is highly advanced as a "Smart City" and is successfully transforming two districts into "smart districts" (Duncan, 2016, p. 10).

Triangulum

Triangulum is a five year € 25 Million project funded by the European Union. The German technology institute Fraunhofer IAO manages the project and has to ensure co-creation among the participants. In Eindhoven Strijp-S will be combined with the district Eckart-Vaartbroek; Triangulum partners will look at the local scale of especially these two areas.

The initiator for the Triangulum project was the 'man in Brussels', van de Ven, Head of the Brussels Representation of the Eindhoven Region, who also was head of Policy development for EUROCITIES from 1995-2005. He activated the different stakeholders, and notified the relevant people in Eindhoven about this European call. In this the 'Smart' motivation was amongst others to receive European funding for already growing ideas.

On 3 December 2013, the executive board of the city of Eindhoven has decided to agree on the positive reaction of the municipality to reply to the call (Triangulum) of the European Commission to propose projects in the Smart Cities & Communities programme. This initiated a European

consortium, under the lead of Eindhoven, with key partners involved from the triple helix (Eindhoven, 2014). With this decision, the municipality and Woonbedrijf together aim for integral urban area development in the Smart City framework.

In October 2014, the partnership for Triangulum got together to talk about the contract which was settled in three months before the project took off 1st of January 2015. The consortium in Eindhoven consists of five partners: VolkerWessels (and PSB), The technical University of Eindhoven (TU/e) Woonbedrijf, KPN, and the municipality of Eindhoven. This local consortium receives EUR 6,4M, from the European Commission.

In this period of forming the Triangulum partnership, Woonbedrijf noted that a risk was that the renovation of social housing would turn these houses into higher segment housing, making them available for the 'free market'. This would go against the core goals of the housing association. Therefore they discussed this with the municipality, to make sure that the rents would not go over the maximum monthly cost for social housing. This transparency is necessary so each partner knows upfront what is at stake.

Reasons why Eindhoven won the call are formulated in a presentation during the Triangulum project presentation SCC Networking cocktail: "We read the call very carefully and ticked all the boxes . . . We boldly went beyond the call" (Unknown, 2014, p. 15). On the same slide is mentioned that partners still need to be specific about how much KwH, CO2 they are going to save. And that they need to "be realistic! E 25 mln is not that much for what you have to deliver!!" (Unknown, 2014, p. 15).

For Triangulum in the municipality of Eindhoven, the alliance manager Henk Kok is part of the municipal sector strategy. This sector is part of the portfolio of one of the three members of the executive board, Roy Beijnsberger. He is responsible for the Smart City strategy in Eindhoven, therefore he takes at times different roles, from being a sponsor, ambassador, 'crowbar', or 'greaser'. For example in the role of ambassador and sponsor, van Beijnsberger takes on international activities, like recruiting a manager to implement Woonconnect, a specific tool within Triangulum. Beijnsberger sees his leadership more on a strategic than operational level and has based his Smart City strategy on collaboration:

> We don't have a heavy in-house Smart City organisation, unlike many other municipalities, but approach the Smart City from a network and collaboration perspective, since we are convinced that Smart City aspects are everywhere in the organisation, and that the emphasis should be on external collaboration. Therefore we are collaborating with the TU/e, Philips, Heijmans, etc. So we have a light in-house Smart City structure (Beijnsberger, 2016).

Analyse Governance Starting Phase

The municipality of Eindhoven and the active role of the mayor demonstrates leadership on the way towards a Smart City/Society, with a clear vision and high ambitions. Also on the Triangulum project level in replying to the EU call and 'boldly' going beyond this call, shows off their high ambition and objectives which favoured Eindhoven over other cities.

The city of Eindhoven say they have strong commitment towards its citizens to enhance the quality of life trough quadruple helix collaboration in living labs, enforcing bottom-up developments, and supports this by providing upfront 'Smart City' investments to realise these ambitions. The municipality has installed a Smart City board to increase cross sectorial municipal collaboration. The board sees 'data' and 'external parties' as essentials to improve integral urban area development, in which "emphasis should be on external collaboration".

On a city level, the municipality has “unclear priorities and often also unclear targets with respect to smart solutions.” (Duncan, 2016, p. 88). This also shows on the level of Triangulum, where they are not clear in this starting phase on their objectives and concrete targets.

Locally in the areas Strijp-S and Eckart Vaartbroek, key stakeholders have been in close contact with the municipality. Especially in bottom up activities and innovation, but also research projects regarding the Smart City concept. PSB even published a Smart Vision document for the area to communicate their views on active participation in the area. In Strijp-S a state of the art data-net is developed to use ICT as a backbone for the area, possibly to improve service integration. The scale of Strijp-S might be too small and market parties might not be transparent about their motives for collaboration. Woonbedrijf in Eckart Vaartbroek is an ambitious and committed housing organization willing to steer on ‘Smart’ transformation, showing leaderhip by providing financial support for renovation projects. Woonbedrijf is transparent towards the municipality regarding the Woonconnect project and their core goal, providing social housing, and possible conflicts.

8.2 Planning

2.1 Rebuild and analyse the strategic framework of the city

According to Depla, the loco-mayor and alderman of economic development of Eindhoven, a Smart Society is a city filled with technical possibilities and innovations to improve the quality of life. Depla gives citizens a central position in the usage and production of Smart ‘solutions’. Next to this bottom-up participation strategy, he points collaboration is the key in this effort of becoming Smart. The area of Stratumseind, the most crowded entertainment area in the city, is an example of an intense collaboration where municipality, the police, the technical university and higher education, together with companies like KPN, Atos and Philips are working towards a more safe public space (Daalhof, 2016). In Eindhoven, the ‘Smart City’ process starts with simple projects, like smart parking or smart trash handling, and can further develop when demand rises, so the city can become smarter. There is awareness that ‘getting smart’ is a continuous effort with endless possibilities (Daalhof, 2016).

The municipality of Eindhoven will take a number of measures on the road towards a smart society. Until 2018 about 1,8 million euros will be spent extra to become Smart. This will contribute among others to optimal usage of ICT and data exchange. Alderman Wilbert Seuren signals that the role of the government is changing into the current network society. That’s why Eindhoven will be improving the design-ecosystem and usage of design and technology in solving municipal issues and developing knowledge and relations. Co-creation will be stimulated, and financial collaboration will be searched for, to develop new business models. Through the programme ‘resident and municipal participation’ the municipality of Eindhoven wants to increase local participation (B. Brouwers, 2015b).

Transparency and openness of data is an absolute must for the success of the Smart City, according to Neeltje Somers, of the municipality of Eindhoven: “Everyone needs to be able to access all data, if not companies will try to make money out of it . . . Innovation is only possible in total openness”. Eindhoven has stricter standards on privacy compared to the national guidelines (Unknown, 2015b).

2.2 Formulate a long-term vision, and define objectives, approach and lines of action

Long-term vision Triangulum

The Triangulum smart cities and communities project aims to upgrade the quality of life for the citizens of Eindhoven and the rest of Europe (Kok, 2015). Triangulum aims for demand driven area development based on a clear shared vision of all parties involved. The vision for Eckart Vaartbroek is in line with this Triangulum vision.

Vision Strijp-S

In 2014 PSB initiated the 'Smart Strijp-S Vision' in which diverse stakeholders were gathered to express intention to collaborate on road-map projects, under the umbrella of the Smart City concept. The vision is used to respond to current problems and needs in the area whilst capitalizing on the innovative Living-Lab position of Strijp-S (Mak & Roodbol, 2014) and in order to prioritise core activities that lead to an implementable roadmap. "The goal of S-mart Strijp-S is to activate urban innovation for value creation that enhance the general well-being of individuals and the community" (Goulden, 2015, p. 1).

> The vision for S-mart Strijp-S has emerged from within an overarching position of Strijp-S as 'creative city' and 'living-lab'. . . The S-mart Strijp-S vision incorporates a broader perspective on resource sustainability, going beyond natural resources to incorporate an equal emphasis on urban and human resources; nurturing the conditions for both a thriving and a resilient community (Goulden, 2015, p. 1).

van Eijkeren, Real estate developer active in Strijp-S says that local support can only be acquired by sharing visions and dreams based on bottom-up possibilities. This is how an innovative climate is created, which attracts human capital and businesses (Van Eijkeren, 2016).

Objectives Triangulum

The European objectives are that Triangulum will see Eindhoven, Manchester and Stavanger address energy, mobility, innovation and (open) data in an effort to improve the quality of urban living in general and of sustainable energy and mobility in particular. The first newsletter of Triangulum started with: "We have a clear objective: Triangulum is going to demonstrate, disseminate and replicate innovation, urban solutions and a detailed framework in order to co-create our future 'smart' cities'" (Triangulum, 2015).

Service & application integration in this project is an objective on the local scale of Eindhoven "The objective . . . is to demonstrate an integrated approach towards developing smart districts through a combination of Energy- Mobility, - Building technologies and integrated infrastructures." (Duncan, 2016, p. 89).

The Triangulum objectives and the social relevance were agreed upon during the constituent consultation phase, which formed the base to connect the needed stakeholders. The project has multiple sub-project objectives, for example to develop and roll out Woonconnect, a digital tool for renovation within Eckart Vaartbroek. Scale and the (national) standardisation of this tool are of importance for the level of success of Triangulum.

Below gives an overview of the objectives for the impact of Triangulum in Eindhoven:

- Significant increase in joint ownership of Smart City Eindhoven among users. Citizens and other relevant actors will be engaged in the process of investing into Eindhoven as a Smart City;
- new, smarter way of working of the city administration that allows true integration of Smart City aims and objectives within and outside the municipal organization;
- the implementation of innovative energy saving technologies that will reduce energy bills and limit CO2 emissions with a factor three (67%);
- data infrastructure and sensor network got a boost, when the open data platform further facilitates smart city developments;
- people know they've been consulted and projects are being implemented in co-creation;
- there's been a sustainable transformation of public space, and housing is still affordable;

- there's an uptake of smart solutions and a redefining of quality of life (Triangulum, 2016a).

Approach

Triangulum is a demonstration project for the EU. Including follower cities in the project organization stresses the wish for repeatable solutions. "The Triangulum project will demonstrate how a systems innovation approach based around the European Commission's Smart Cities and Communities Strategic Implementation Plan can drive dynamic smart city development" (Mol et al., 2015, p. 56). Data exchange is a central governance factor in this approach: "Eindhoven has . . . combined a set of technology-based projects to enhance energy-efficiency in buildings, provide renewable energies and sustainable mobility to the districts based on an ICT and data-related approach" (Duncan, 2016, p. 89). In this living lab approach, with the two smart districts, ICT & Telecom become part of the development process; more integration and more openness; show case cross overs to stimulate innovative thinking. Fi-ware standard is used in Strijp-S as base architecture. According to van Dieren, Strijp-S is a living lab in which ideas can be tested to further enrol in the rest of the Netherlands, the same accounts for Woonconnect and the other projects in Eckart.

The municipality and the housing association Woonbedrijf are shifting towards value cases as a strategy in Smart City implementation. This means the city is focusing on the social/societal added value of projects, not only on the financial feasibility. Van Oers (KPN) agrees on the necessity of the value case approach. He refers to Woonconnect, where citizens are being stimulated to renovate their tenant housing. Here the digitalisation of the houses can lead to a 'customized approach' in redevelopment and restoration of the housing sector. The application 'Woonconnect' offers residents and organizations insight by integration of data and functionality. Central function is the support of interaction between residents.

In the area Strijp S, according to van Dieren, developing a 'value case' is easier said than done: "The municipality makes the step towards a value case, but for businesses this will not pay for your people. Financial feasibility stays an issue".

According to Willemse, from KPN, "The approach of this project is strongly directed by the EU-demands presented in a comprehensive bookwork. These demands are forcing the stakeholders to go through a collective process to present a clear vision. The EU has also demands for the documentation which gives some support to the transfer of knowledge if whished for or become necessary by changes in the teams. Communication, transparency and accountability is hereby enforced".

Lines of action

The different areas in Eindhoven will have different lines of action related to the local needs. In general, Van Eijkeren, real estate developer, states "Top down development doesn't work in The Netherlands, it only works when society is widely supporting the developments, therefore we are aiming at including Smart Citizens in the entire process, that is our way of building a Smart City" (Van Eijkeren, 2016). A new view on city development is discovering the demand on the basis of participation in order to develop the area together.

PSB was already in existence for some years and initiated multiple projects functioning as an incubator to test solutions to be rolled out elsewhere. According to van Dieren:

> By the mix of players a new integrated domain arises. Cooperation in the ecosystem (including citizens) implies a demand driven approach. In this, data and applications add a new layer to Urban Area Development. The Strijp-S-area is further developed with the input of young citizens and start-ups. Participation in the design phase should lead to participation

in the exploration phase. Therefore we have set up the foundation of a special fund to stimulate innovation activities in the SME's.

2.3 Select the fields of action

Strijp-S

Fig 8.1 image area Strijp-S

The Strijp-S area is located north east of the city center. It is the former business park of Philips. Since the year 2000 first conversation were held on the redevelopment of the area. Since then housing has been developed in the area, as well as businesses from the creative sector. In 2012 the area gets its first permanent residents. The area is further developed and is attracting young residents, in the year 2015 about 78% of its residents are between the age of 20-34 years old (Wikipedia, 2016a).

> The former Philips industrial complex will become a creative smart district. A district-wide ICT solution will allow residents to access different kinds of infrastructure, such as booking electric vehicles from a district car sharing scheme ore using smart parking concepts. In this way, the IT-based tool will help residents to develop sustainable patterns of energy and mobility behavior.(Triangulum, 2016a, pp. 1-2)

Eckart Vaartbroek

Fig 8.2 image Living Area Eckart/Vaartbroek

Eckart, is located in the Woensel-North area, north of the center of Eindhoven. This typical housing area dates back to the 1960s and consist of about 5000 single-family housing, privately owned or owned by housing association Woonbedrijf. Although the housing types are quite uniform in their

building type, the social composition of residents is diverse. Central in this area is the Amandelpark, which has been redeveloped in 2007 (Wikipedia, 2016b).

> A different set of challenges is posed by the Eckart Vaarbroek district, where energy-efficiency renovations will be carried out on the social housing stock that predominates in this area. In order to precisely calculate energy savings, the project will use an IT-based instrument capable of modeling costs and yield in a 3D visualization of the district (Triangulum, 2016a, p. 2).

2.4 Set up a team responsible for the implementation of the strategy and establish roles and responsibilities

On a meta-level the consortium is aligning activities with the Frauenhofer Institute as overall coordinator.

Triangulum consortium in Eindhoven

The stakeholders in Eindhoven have been familiar with each other for a longer period of time, together they were willing to make a step forward stimulated by EU-funding. To apply for the EU call a partnership has been formed. After the granting of the EU-funds the partnership is contractually formalized. The consortium consists of five partners: VolkerWessels, Woonbedrijf, KPN, the Technical University of Eindhoven, and the Municipality of Eindhoven. They have developed special agreements, local rules are for example: having only one external voice, decision making based on consensus, with specific procedures in case consensus is not reached, having a yearly 'Grand Assembly'. The grant agreement with the EU acts as the basis for agreements on property of data, information and project outcomes: "General responsibilities are that the work is done in good harmony, open communication and a positive-critical attitude towards each other, transparent and mutually defiant. There are no hidden agenda's," according to Willemse from KPN. Also according to Hijdra from Woonbedrijf "Transparency is key in this phase; transparency about clear targets, and the existing regulations per partner. It is mainly about the agenda of the different organisations, and of course also about the process of execution and administration. For example clear performance indicators and how to report these".

According to Kok, alliance manager from the Eindhoven municipality "Within the context of an EU-project there is always a strong focus on legal and financial frameworks. This helps in building a basis for collaboration between stakeholders".

When asked about the aspects of collaboration, according to Van Dieren, from PSB "Collaboration demands for a good match between the involved personalities and for each stakeholder the right representatives that can act on different levels. The group individuals should be able to be complementary to each other, for example in having a more content or more organization oriented focus".

Roles and responsibilities

The municipality is the coordinator and external (international) voice for the partnership. The municipality has the role of 'Alliance manager' or 'shepherd' as the first among equals offering facilitating leadership. Also based upon the experience in working within the context of EU-activities and regulations. The responsibilities for the alliance manager, Henk Kok, are mentioned on his LinkedIn page:

> Leading this alliance partnership in Eindhoven and representing our interests, aims and solutions and communicating them in an international context. This entails the following

responsibilities:
Chairing the table of the Eindhoven consortium partners in the smart city project Triangulum 2015 – 2020, coordination of the municipal activities in the project; Reporting on the results to the EU; Coordination of the activities of the consortium with the other international partners in the project. . .; Communication to Eindhoven and the European citizens about the results (Kok, 2015).

According to Yang, from the TU/e responsibilities are clearly defined within this project: “We have a well-structured organisation. With clear manager, a general board of different partners of Triangulum, and there are different project managers for each project. Each partner knows their role to play, their responsibility is relatively clear.”

There are more leading parties in the Triangulum team, this differs per project. Next to the municipality, PSB and Woonbedrijf in the ‘Woonconnect’ project are mentioned as leaders by the different interviewees. This also is stated in an official document of Triangulum: "Partner Woonbedrijf is leading in the renovation process of 200 town-houses. Moreover, in close cooperation with KPN, they want to report on the progress and intermediate conclusion drawn out of the first implement of the Woonconnect tool in the retrofitting process”(Triangulum, 2016a, p. 3). The same document states “the municipality of Eindhoven will take the lead in a Smart lighting project around a pond in Eckart Vaartbroek and they will develop a dashboard of performance and a basis for an App around the ICT open data platform in both areas.”(Triangulum, 2016a, p. 3)

According to van Dieren:

> The ideal qualities of a good leader - knowing what’s at hand, familiar with the different cultures, profile of a business developer, fast acting, good communicating change manager- are looked after in the different people involved. Stakeholders take responsibility and show leadership for specific tasks in their own direct influence and have to check on the relevance of sharing knowledge with the other stakeholders.

According to Willemse from KPN, "the ‘spirit’ or actual motivation and commitment, is more important than the ‘law’ [the comprehensive contracts and agreements to the letter]”. He states participants are able to act in a not to restricted environment to support real innovation, in which the focus lies more on the shared vision and the right attitude to make things happening, than on the shared contracts.

2.5 Establish how to produce and select ideas

How ideas are produced is not clearly defined. The impression is that most project ideas were already under study at the moment of writing the call for Triangulum. Only for Strijp-S and iCity the selection of other innovative projects still needs to be done. Since iCity has recently done a call for proposals there is a set of selection criteria published. Projects need to take the following into account when submitting project proposals:

- Be innovative (10%); “we are searching for innovative products, services and crossovers. The used techniques does not have to be completely new”
- Improve the quality of life (20%); “we are not aiming for technological gimmicks […] products and/or services have to add extra value [directly/indirectly] to the end-user”
- Be developed within the described Smart City layers (10%); “The cloud [data] layer, the liveable layer [tangible part of city], and the infrastructure layer [roads, pipes, cables]. The interaction between these layers makes the city smart. New products and/or services need to be developed within these layers. They also need to stimulate crossovers.

- Have an influence on the public space (5%);
- Be generic and replicable (20%);
- Be scalable (10%);
- Increase employment within the area Strijp-S (5%);
- Have a solid business model which is based on competitive prices (20%); have a solid and transparent business model (Unknown, 2015a).

Van Dieren states that "the plans need to be commercially and technically viable, in every city. They need to have a business plan, and connection with daily reality" (Unknown, 2015c).*Whether actual projects for iCity will be selected shows on 6th of October, 2016 -> Mail Thijs van Dieren!*

2.6 Define a monitoring and evaluation methodology

The University of Eindhoven has set up general baseline indicators for monitoring and assessment purposes of all projects in the three lighthouse cities of Triangulum. In Eindhoven the TU/e together with the different project managers have then discussed per project what the additional indicators will be. Most indicators for measuring progress are set by all partners in cooperation at the start of the activities, but for some projects, these indicators are still to be discussed. The Multilevel Impact Assessment and Monitoring is described in the current Baseline Report for Work Package 2 (Triangulum, 2016b). This report is still in its first draft, and first results cannot be shared yet, therefore no examples can be given.

About this methodology Yang from the TU/e says "We started a baseline data, for some indicators, for example energy usage is used from companies, this data might not be very accurate, but we use this as a baseline. We do a yearly evaluation and update of indicators."

Analysis Governance planning phase

Eindhoven is active in their Smart City strategy and knows they need to work with many stakeholders to realise Smart projects. High ambitions and expectations of the Smart City start with planning 'simple' projects. They say the focus lies on bottom-up participation, co-creation, transparency of data, and optimal ICT usage. Although Eindhoven claims to be a bottom-up Smart City, the Triangulum projects are mostly generated top down. Some of the projects, like WoonConnect, are in desperate need of citizen participation to make this project success.

The collaboration within Triangulum is based on an earlier developed long-term strategic vision and intense conversations at the set up between possible partners on the availability of resources, claims for part of the funding and openness about agenda's. The spirit, commitment and motivation of the partners is for some participants more important than the underlying contracts. European documentation, and a set of agreements, especially transparency is mentioned as a key component towards successful collaboration as well as "having the right people for the right tasks", according to van Dieren. The EU is enforcing communication, transparency and accountability. "On the European level, accountability towards the European Commission is concerned with external regulations" (Hijdra from Woonbedrijf). The stakeholders here show awareness of the impact of different governance factors.

The leadership skills mentioned by Kok relate very much to my definition of leadership in governance, in which there is no hierarchy to steer from, thus understanding concerns and interests is crucial. Project leadership is shown to be clearly defined. Each partner is responsible for specific projects to implement.

Projects are based on key themes and have an 'integrated approach' which refers to the combination of data, ICT, and end users in the area development, and sometimes combining different technology

aspects, for example with the smart lighting project. It is not really clear on what basis the different projects are selected which form the basis of the Triangulum project, and to what degree the projects actually contribute to the goals and objectives of Triangulum. In Strijp-S there are selection criteria mentioned for specific projects at the iCity tender. All interviewees have confirmed that improving the quality of life for the citizens is the end goal they are striving for but this abstract goal is not (yet) operationalised for the different projects. Improving the quality of life by demand driven area development is based on a vision. I see this as a very broad vision without clear objectives, which can lead to a lack of accountability. However Hijdra says accountability "is internally sorted by the partnering organization by linking the project to the vision, mission and strategy." On the other hand, external accountability is sorted by meeting legislation and accountancy conditions.

The development of indicators and actual monitoring and evaluation is an independent activity of the university. Partners agree collaboration with knowledge institutions is necessary to make sure to objectively evaluate projects. "If not, we can mark are own paper", according to Van Dieren. The TU/e is working on a monitoring and evaluation methodology, with general indicators for all cities and more specific indicators per project. However, since the objectives are not clear yet, also the indicators are still 'under construction'. To decide on these indicators, input is gathered from the specific projects and project managers, to create a customized approach.

8.3 Development of projects

3.1 Activate the implementation team and start the activities for implementing projects

The first Triangulum newsletter shows that "The Triangulum project started highly motivated with a kick-off meeting in Manchester in February 2015. On the following weeks, Lighthouse Cities started detailing the implementation process of smart solutions within their lighthouse districts"(Triangulum, 2015). In October 2015, "local experts from the implementation layer [i.e consultancy, architects or ICT developers] and from political and administration bodies helped enhancing the knowledge about Triangulum activities" (Triangulum, 2015). During this period of the project vision documents have been designed by a specialist consultant, and made widely available. Citizens are informed, activated and motivated through intense communication with people in the area with a focus on SMEs participation. However, according to van Dieren, in Strijp-S "still a lot of personal communication and an extent of resourcing is needed to evoke participation".

Henk Kok, alliance manager, on his LinkedIn page, about the Smart Society Eindhoven "we stopped only talking about it and we now implement it". In doing so "the development in an atmosphere of co-creation between partners and stakeholders" has his special interest (Kok, 2015). On the contrary

Four-weekly consultations within the triple helix organization are held, with all relevant stakeholders on operational level in which the decisions are made under the chair of the municipality. Sometimes experts are available at these sessions, but top executives or CEOs from the stakeholders are not involved, since the parties are already on board, thus actual partners, and working towards their goals.

3.2 Generate, select and organize project ideas to achieve your objectives

As stated above it is not clear how project idea's were generated, with the exception of the Icity call. Most project ideas came with the partners that are already active in the area's.

> The Eindhoven partners will realize 20 activities that will improve mobility and energy in a sustainable direction via the use of innovative ICT solutions that make use of open data.

Stakeholder involvement - citizens, (local) business, knowledge institutes and the local government work in a co-creation process towards shared aims to create demand driven solutions. Through demonstration and monitoring, resulting in evaluation these solutions will be made robust to be able to replicate them elsewhere (Kok, 2015).

Projects are either produced or selected from a top down or from a bottom-up perspective, sometimes the middle out approach is chosen. A bottom up approach is chosen for innovative projects coming from the iCity tender.

Strijp-S:

Seven projects are conducting in Strijp-S covering Energy, mobility and ICT perspectives, such as smart office, smart mobility, smart charging of electric vehicles, smart lighting, sustainable energy supply and soil sanitation, optimization heat provision in existing buildings of Strijp-S. The aim is to build up nearly zero or low energy districts, integrated Infrastructures and sustainable urban mobility (Unknown, 2016c).

Partner VolkerWessels is as most partners, involved in more projects. One of them is the backbone. The backbone is a system of complex hardware and software that monitors and controls street lighting, mobility, houses, offices etc. of the 'smart city'. The backbone makes it possible to monitor and control the innovative lighting installations of Light-S (smart street lighting system). In addition they're involved in a soil sanitation project together with sustainable energy supply and a new connection to newly build biomass power station (Triangulum, 2016a, p. 3).

Apart from these upfront selected projects, in Strijp-S also a more entrepreneurial approach is chosen towards generating project ideas. Some projects still need to be generated, selected, and organised.

Therefore, on the 28th of June in 2016, the municipality of Eindhoven, together with VolkerWessels and the TU/e opened an 'iCity Tender'; an international competition in which small and medium enterprises, or start-ups and entrepreneurs can sign up with a 'smart' application for the area. Five ideas will be picked by a jury. Each plan can get maximum of 5000 euro (in phase 1) to further develop, with a possibility to receive another 20.000 euro in phase 2. (Unknown, 2015c). How these projects will be selected is mentioned at step 2.5 under 'define selection criteria'.

Eckart Vaartbroek:

The three projects chosen for Eckart Vaartbroek are Woonconnect, the 1km public road around the pond and the Windgenerator. These projects are initiated from the Triangulum partner program, and are all being executed in collaboration with the residents. A more detailed description of these three projects:

1. Project Woonconnect is the renovation or retrofitting of housing in the area. In the beginning of this pilot project, about 200 houses will be tested for renovation. The Housing supply in the area will be digitalized by Woonconnect:

   In the refurbishment process, the dwellings will also be made interactive, allowing the tenants to manage their energy consumption through the use of innovative ICT applications. In order to visualize chosen measures and presents the cost effects in terms of rent; enable tenants to compose the combination of measures and plan the moment of realization energy costs simultaneously; create a database of possible solutions and measures matching to a

specific type of housing; create a live 3D BIM archive of the housing stock to be used for future maintenance. About 5000 houses will be digitalized (Unknown, 2016b).

2. Installation of PV Windturbines on building: Woonbedrijf is in cooperation with a start-up company (unpublished) who is developing the PV Windturbine. Woonbedrijf made a building available for testing this project in real life. If the project is feasible, guaranteeing a reasonable payback period, than the tenants living in this building, can cut down on their energy bill.
3. Improvement of public space by a Smart Lighting project for a 'kilometre around the pond' in the area of Eckart Vaartbroek: The area around the pond is badly lit, making it an unsafe public space at night.

Open data:

The Technical University of Eindhoven develops an open platform to share on these project experiences with other cities. Fraunhofer IAO has great expectations of this ICT architecture that is one of the important deliverables of the project. Yang, PhD at TU/e, responsible for the assessment and monitoring of the projects in Eindhoven says that "This [open data platform] is a complicated data hub, considering the privacy issue of the ownership, and how continuity is in place after Triangulum is finished". It is to early now to reflect on this project. On topics how to deal with open/big data also the municipality of Eindhoven has a leading role "We have a specific protocol in regards to privacy aspect" (Beijnsberger, 2016).

In organizing local participation, for as well as in Strijp-S as in Eckart, participation in the development phase must lead to participation in the usage phase, creating ownership. The ownership and use of data plays an important role. In Eckart Vaartbroek data is registered together with the residents. Two forms are in use to regulate permissions of the use of the data. According to Hijdra from Woonbedrijf, "We don't use data as a source of profit but create trusted third party and citizen's data ownership.

In order to organize the the WoonConnect project "City Studios are used: physical meeting places in which citizens are invited to discuss the challenges within their district, and in which interactions with potential suppliers offering/developing solutions to the problem that exist are organised. The city facilitates this process and undertakes to (co-) implement the solutions that are defined jointly." (bron, p.9).

Strijp S implementation team:

- SDK Vastgoed (Real Estate Developer)
- Park Strijp Beheer (lead)
- Local SMEs and citizens/residents
- Eindhoven University of Technology

Eckart/Vaartbroek implementation team:

Project Woonconnect	*Project windturbine*	*Project Public Space*
Woonbedrijf (housing association - lead)	Woonbedrijf	Woonbedrijf
De Twee snoeken (architect)	Startup	
KPN		KPN
Municipality		Municipality (lead)
TU/e	TU/e	Tu/e
Local residents	Local residents	

fig. 8.3 Overview of the involved stakeholders

3.3 Ensure financial support to the projects

The Smart City initiative is supported by municipal financing. Triangulum subsidies should support the selected projects in their living lab testing phase, together with the investments made by the different partners. About the European subsidies Beijnsberger, from the municipality, states he does not recognise a risk of subsidies "you will always have to be responsible and accountable for the subsidies in the results you deliver".

Partners are collectively in search of suitable business models for repeatable business that will make it affordable to upscale proven solutions. Some partners are in a transformation process from business case driven to value case driven operations. A report on Eindhoven shows "some are also testing public-private co-investment strategies into smart technologies, yet these approaches are still at an early stage and need further verification and refinement." (Duncan, 2016, p. 88).

Furthermore in Strijp-S a relative small fund, iCity, is going to stimulate and ensure innovative projects financially. When partners come together, an issue can be that they have different business models, due to the mix of products and services. According to van Dieren, some partners are thinking in "selling subscriptions", when this is either not realistic or useful, or incompatible for the project involved

In Eckart Vaartbroek the residents are expected to contribute to the renovation of their housing. If they do not collaborate, the housing association will have to take on the investment, or nothing will happen at all. The Technical University of Eindhoven will stimulate a fund for innovative services (Triangulum, 2016a, p. 3). For the windturbine, financial feasibility will be the main bottleneck regarding up scaling of the project. Nevertheless it will be built in the coming months, thus making it the first project in Eindhoven to actually be implemented. Like this project, in Triangulum, public-private co-investment strategies are still in the testing phase.

3.4 Implement the projects

"Triangulum is currently in the implementation phase. By 2018 all smart solutions will be installed" (Duncan, 2016, p. 89). On the Triangulum site of the Technical University of Eindhoven (https://www.isbe.tue.nl/projects/smartcity/default.menu/projects/triangulum) a list of projects is mentioned,

however only two of the actual 'links' to these projects are used. The current status regarding their implementation status is unknown. So far, I cannot tell how much projects will actually be implemented. Many Interviewees stayed unclear about the actual status of the implementation of the projects.

1) Smart district - Locally produced renewable energy

The refurbishment of the Eckart Vaartbroek district will go along with the provision of local energy-production from renewable sources, in this case by the placement of 2 wind turbines on strategic buildings in the area. Where useful, other techniques can also be applied, like for example solar boilers and energy storage facilities. Two locations are chosen for the wind turbines which are Tarwelaan and Andromedaplaats. A turbine in open air would generate 400 kwh/year and 1692kwh/year at Tarwelaan and Andromedaplaats respectively. Due to lower startup speed, IRWES will generate 88% of the time energy. In total, the energy is sufficient for 5 to 7.5 apartments or public space usage.

Responsible company: IBIS Power Involved parties: Woonbedrijf Eindhoven, Municipality Eindhoven Technology University of Eindhoven). Funding Triangulum(150.000Euro)

2) Renov. homes E&V & participative society

The partners aim to achieve that at least 20% of the tenants will opt for a upgrade that, 200 dwellings (in 1,300 dwellings in total) with a total area of 20,000m² will be refurbished between 2015 to 2017, with a view to carry out the refurbishment of the remaining 1,100 since 2018. This will contribute to an estimated saving of 800 tonnes of CO2 per year. In addition, the Natural Step, pays particular attention to limitation of the use of harmful chemicals, the efficient use of resources and the human factor in all their operations. The project will be achieved through the co-creation process (WoonConnect) leading to increased awareness and ownership of the challenge. The four step co-creation process allowing the tenant to become co-commissioner:

- Establishing the social grid of the neighbourhood; perceptions, wishes and demands on a community level.
- Demand Analysis and Gather information on wishes and demands of the tenants and find possibilities how to address these demands.
- Development of measures - Translate the findings in a set of realistic measures that enables the tenant to compose the final specifications of the refurbishment.
- Individual Selection - The last step for the tenant is deciding about these measures and the planning of the renovation.

Partners: Woonbedrijf Eindhoven, De Twee Snoeken (architects), Funding: Triangulum(1.225k Euro)

A positive exception is the Woonconnect project. In the first Triangulum newsletter of November 2015, the status is described.

> In Eckart Vaartbroek we are almost ready to start the interactive process with the citizens . . . The partners, KPN, Woonbedrijf and the municipality of Eindhoven, do this in close co-operation. . . . Before we start with the renovation of the family homes**,** *one of the most important tasks in the project has to do with citizen participation and co-creation.* Together the partners made an analysis of all the relevant players, which are in one way or another related to the renovation . . . The aim is not only to encourage sustainability projects, but also to stimulate the engagement and participation of residents (Triangulum, 2015).

The digital platform to engage residents 'WoonConnect' includes an online survey, where every household can give their opinion on different topics, like renovation. Besides this survey, they can see their own house in a digital 3D model. For the first 200 households, that will be renovated, Woonbedrijf gathers this information in a personal interview. About this process Hijdra from Woonbedrijf concludes that "Communication to improve participation is very time consuming". Not all residents are willing to collaborate. The implementation started with people who are tenants, but Yang and Hijdra foresee difficulties when owners need to be activated to implement sustainable housing solutions, since Woonbedrijf has no say over their private homes.

Analysis Governance development phase

The Triangulum project aims to be demand driven, but most projects have already been selected prior to citizen involvement. Now during the development phase different partners see different priorities. From the municipal point of view collaboration is key in this effort of Smart City implementation. The municipality has no power of hierarchy, therefore the municipality steers on collaboration, showing active leadership by managing the partnership and chairing the monthly meetings. In contrast to this view, Willemse, from KPN says "Most parties are working on projects that they can execute by themselves. Thus here collaboration is not a full-time job". However, since collaboration is based on participation I would say collaboration is still key in this project.

Woonbedrijf and KPN need residents to participate in their WoonConnect project in order to successfully implement renovations. This also accounts for the other projects, like the Smart Lightning project. Citizen participation is limited until now. Activating residents is more complex than planned, and an intensive personal approach has shown to be necessary. The project and its results will be depending on the less predictable participation of citizens.

As project leadership is already made transparent in the planning phase, I do not foresee any direct issues regarding leadership in the development phase. According to Willemse (KPN) leadership is mainly related to 'your own' work, and about taking the responsibility to complete this work, and to test whether the right knowledge is available for others. Different stakeholders, coming from totally different branches, are used to think and act in complete different business models, making collaboration a real challenge.

There has been intense communication to activate the implementation team, however, according to some interviewees, personal communication needs to be increased to improve participation. The Woonconnect project shows that participation has a (high) price.

Like in the windturbine project, in Triangulum, public-private co-investment strategies are still in the testing phase.

8.4 Monitoring and evaluation

Since Triangulum is not even half way its planned lifetime, there are no reports available about the topics monitoring and evaluation.

4.1 Monitor progress and evaluate results

Monitor progress

The Multilevel Impact Assessment and Monitoring is described in the Baseline Report for Work Package 2 (Triangulum, 2016b). This report is still in its first draft, and first results cannot be shared yet, therefore no official examples can be given. The following is a first impression of the monitoring progress.

The first newsletter of Triangulum stated that “first visible results have already made their appearance with […] new governance processes in some cities (Triangulum, 2015). Whether these new governance processes are appeared in Eindhoven remains unclear. It’s likely that this refers to some of the governance aspects we have just discussed in the case description.

In the project organization of Triangulum monitoring is a build in function because of the existence of the ‘follower cities’. On a European level, Beijnsberger says that “. . . through which you are getting adjustments and improvements of the things you are doing. That is how you keep each other sharp and to learn from each other”. In contrast de Vries from the TU/e finds that the European cooperation is complicating the work: “It is difficult to keep the three lighthouse cities, Manchester, Stavanger and Eindhoven on the same track, since there is a high demand for local customization.” The alliance manager, Kok also experiences the EU as a complicating factor but in another aspects, saying “it is often difficult to have a conversation with the EU on matters of content since the control function is focused on formal procedural aspects and not on the content.”

On a more positive note, Van Dieren says all representatives are dedicated to make this project into a success. He mentions process continuity as success factor, so stakeholders strive to keep their employees involved during the entire project. According to him, the collaboration performs well due to bi-weekly meetings of the stakeholders with an active role of the municipality. Here stakeholders are respected in their specific roles and interests. On the other hand, he mentions misunderstanding is sometimes caused by different interpretations of the partners coming from different sectors. In order to maintain collaboration *the right chemistry* needs to be in place between the individuals. “Sometimes people without knowledge of the content are involved in the process. Especially with new people and organisations trust has to grow, since it can be difficult to interpret their motivations”.

Sharing data within the partnership is often not a problem because partners have signed for confidentiality. According to de Vries from TU/e the EU direction towards open data is much more problematic: “There are many juridical hordes to take and many uncertainties. Very often even the lawyers don’t know what is allowed and what forbidden”. The TU/e is involved in developing a data platform to share experiences between the participating cities. It is to early yet to judge the progress in this domain of European ambition. They are monitoring the outcomes of the projects regarding their objectives and baseline measurements. The rules for collecting and manipulating data are part of the local legislation. According to Kok, from the municipality, permissions to use data is often limited to a specific context so not open for general use. Yang, from TU/e sees data exchange as a possible barrier **“**Most of the time a company owns the data, now we want the data to be shared. The Law and regulation is not clear defined yet, on how ownership is defined.”

According to de Vries, from the TU/e upscaling can become a problem in the future. “Products like ‘Woonconnect’ are owned by specific partners. This might limit future re-use and up scaling because of the needed investments. In the case of Triangulum, up scaling is more relevant in the vision of the EU, less relevant for some partners involved in the partnership.”

Stakeholders experience differences between their organisations that can negatively impact the collaboration. According to Willemse, it is important to realize that organizations all live in a somewhat different context which makes it easy to create misunderstanding. Also van Dieren states that the partners are working from a different structure and culture which asks for time and understanding.

In a Triangulum monitoring workshop, in ....., the folllowing was mentioned by ..... about Eindhoven and Triangulum:

1. Eindhoven came from a crisis - but at the end this was only the basis for people talking to each other (quadruple helix)
2. Main unique thing is the ecosystem;
3. Licence to fail;
4. Many employees of the city or city related services stand on a second foot (i.e. have a second employer) - therefore information exchange is natural;
5. Main area of development is energy: Strijp-S and Woonbedrijf ;
6. Clear city mantras and good communication (technology and design);
7. competing with Amsterdam: “not the most beautiful girl in class but the most interesting”;
8. Smart - is a main mantra driven by the mayor;
9. Eindhoven is doing good and internationally working hard;
10. BUT: few of its inhabitants are excited about it - work to be done (bron).

Many positives notes are made (1, 2, 4, 5, 6, 7, 8, 9) but point 3) is rather particular, mentioning a “licence to fail”, and especially the last point (10) underlines that citizen participation can be a bottleneck for this project.

Evaluate results

No concrete results yet. This step can only be finalized after Triangulum is finished in 2020.

4.2 Adjust and modify

No concrete results yet. This step can be finalized after Triangulum is finished in 2020.

Analysis Governance monitoring and evaluation phase

Attention for monitoring is structurally woven into the project organisation by given the assignment to the TU/e to define and measure project results. Also the incorporation of follower cities should enforce the monitoring function and result in a more objective process of monitoring, adjustment and evaluation.

Stakeholders already experience the complexity of collaboration between completely different organisations in the consortium and on the European level of working together with different cities having different interests. The fact that stakeholders are aware of this in an early stage makes it possible to act on this experience and gives good hope for the future.

On the sharing of data the opinions are mixed. Some experience no problems and think European regulations are sufficient, others are expecting potential problems concerning the ownership of data and related laws and privacy regulations.

8.5 Communication

5.1 Communicate and promote the Smart City strategy

As can be seen in the described previous phases, communication is an influential factor during the entire cycle of a Smart City project since it is often fully integrated with other activities.

According to Kok the consortium has decided to have ‘one voice’ for external communication. Internally they have clear communication procedures to reach consensus.

This decision making in stakeholder meetings seems to work out very well according to the positive experiences of the interviewees. According to Willemse (KPN) “the partnership of Triangulum forms a structure to guarantee the progress of the project, and to stimulate coherence. When different interests are in conflict with the goals, than this will be discussed.” Also according to Yang from the

TU/e “Every 4 weeks, in the general meeting everything is discussed. So the transparency is high, potential problems and issues are discussed, and all the board members are noticed, so everyone can help to solve the problem.” Willemse agrees to that: “Decision making takes place in plenary sessions of partners in which they look for a feasible business model and search for scaling up and standardization of the ideas.” Van Dieren says that “the partnership offers structure to guarantee the progress in the projects and the coherence of activities. Because when there is a conflict between the stakeholders’ interests and the project objectives it is discussed and solved in the partnership collectively.”

In Strijp-S, the different projects developed by partners who each have their own point of view, result in different business models due to the mix of products and services. According to van Dieren this different thinking in products and services works inhibitory to set up a business case.

An important communication medium in many EU-projects is the publication of a Memorandum of Understanding (MOU). Beijnsberger, from the municipality says, the use of a MoU needs to be discussed. Therefore he is in discussion with the chairman of the Smart City Board of the Technical University of Eindhoven how to formulate the MoU: “Global aims and objectives are often written down in these MoUs, we are really translating these to straightforward actions and concrete results”. Objectives in the MoU need to be concrete, so one can tell at finalization where the project was successful or not. From his perspective, Roy Beijnsberger thinks the objectives for Triangulum are concrete enough.

Yang signalized that the latest occurring problems were concerning data sharing, and building the data hub: “This is shared within the partnership, Kok takes the lead, after which we make schedules of meetings, how to solve the problems step by step.” So communication within the consortium is working well to signalize problems and find solutions.

“Many employees of the city or city related services stand on a second foot (i.e. have a second employer) - therefore information exchange is natural” (bron).

Analysis communication

Within the municipality of Eindhoven the communication in the Smart City board improves service and application integration. The communication within the Triangulum consortium seems to be well sorted by having organised meetings, clear procedures, and open discussions. This improves decision making and collaboration, since the notified problems are tried to be solved together or appointed to a specifc partner to solve.

8.6 Conclusion on governance success factors and barriers

“Cities like Manchester, Eindhoven, . . . are thus not only the testbeds for smart districts; they are also the guinea-pigs to discover, test and improve a new governance and business innovation approach to urban development.” (Duncan, 2016, p. 9).

Within Triangulum the focus is on the governance factor collaboration. Different partners were already orientating on the possibilities of Smart City initiatives and decided that Triangulum would be an opportunity to strengthen development if they would join forces.

The municipality is leading in formulating a Smart Society vision and ambitions and the role of citizens in the chosen approach based on quadruple helix collaboration. The municipality takes a facilitating leadership role to bring stakeholders together and to connect the local activities with the European level. The leadership is also striving to a holistic approach from the municipality, installing a

Smart City board to improve integral urban area development. To determine how concrete projects are contributing to reach the high level objectives is merely still a missing link.

Participation is a central part of Eindhoven's vision on becoming a Smart Society and seen as a necessary condition, but realizing participation in practice is still a firm challenge. Related to this I conclude that most of the project initiatives are top-down selected, although the promoted vision is that only bottom up could be successful. The effect of the Icity call for proposals on citizens participation is not yet to be estimated.

Partners in the consortium like Woonbedrijf and PSB have formulate their own vision on the opportunities in the Smart City concept, preceding their participation in Triangulum. This has as effect that partners are from the start willing to take responsibility for their own project initiatives. The partnership is formalized and special rules are developed to work together in the partnership. The regulations from the EU are merely seen as contributing to effective rules to develop a transparent and accountable partnership and to communicate within the partnership and on the international evel.

Although stakeholders are aware of the large differences between the organisations in the partnership it is mainly seen as a possible source for misunderstanding. Although co-creation is mentioned as an opportunity, it strikes me that no-one in the interviews and not in the documents synergy is signalized as major driver for collaboration. This gives the impression that joining forces is more driven by other advantages and that synergy between disciplines and organisations is not a major objective in these Smart City initiatives. The possible risk is that under the umbrella of Triangulum each partner will mainly be busy realizing his own projects, forgetting to optimize the collaboration.

Data exchange is seen as a necessary requisite, that's why the design and implementation of a specific ICT architecture has a central position in the project.

Communication is seen as a positive factor for success, as well inside the partnership as related to the environment. The importance of communication is clearly noted by assuring one voice to the external relations. If communication problems might pop up, it will probably be related to difference expectations of the Triangulum project. As long as the objectives are not very Smart and measurable formulated it will be very difficult to manage expectations of the community concerning the outcome that can realistically be expected the coming years.

Accountability will remain a point of attention as long as the project goals are not explicit related to the higher level ambitions. The indicators still under development to monitor progress during the project will be very important for monitoring and adjustment, but also for evaluation and accountability. The available documentation on the project so far is very limited. If this would not improve the coming years a lack of transparency could become an issue, but it is yet too early to judge this governance factor. Conclusions and recommendations

In this chapter I will present the final conclusions of this research. The conclusions will focus on the main research question 'How are Smart City initiatives governed in Amsterdam and Eindhoven and how can governance factors improve implementation?' I will summarize the main conclusions from the analysis of the two cases, stating how the governance in both cities is realized

9 Conclusion

How can governance sub-factors improve Smart City implementation in Amsterdam and Eindhoven?

9.1 Conclusion Transform

“Smart City initiatives are viewed both as instrumental means of tackling specific problems and as a way to build a community of interest or overarching awareness of the potential of such joint initiatives to provide a platform for continued progress that adapts to changing circumstances” (European Union, 2014).

The governance in the Transform project can be described as: mainly relying on the sub processes Collaboration and Leadership, cherish informal partnership between some major players in the SUL, sharing data to create knowledge and develop insight.

The implemented governance processes were fitted to serve the process oriented objectives of the main stakeholders (developing the cooperation in the area for the long term) but not fitted to serve the formal product oriented objectives the EU strived for with this project (concrete measurable results ready to upscale and roll out, and transferable knowledge, tools and best practices for other European cities).

The analysis of the Transform case shows clear flaws relating to two governance factors that are vital to Smart City implementation: Leadership & Champion and Accountability

Concerning Leadership & Champion, a lack of top management involvement is found, which corresponds with a lack of concrete shared objectives and accountability for concrete realised projects. In fact, this can be seen as a vicious circle: because there are no shared objectives the commitment of top management is non-committal, therefore there is no push on defining shared objectives. As expressed by some interviewees: ‘nobody is accountable’. The lack of short term concrete objectives in the Transform project makes it hard to monitor any progress and evaluate the programme at its closing. The number of changes in political and municipal management maintained the lack of commitment by top managers.

The ILS has shown to be useful as a start-up of the collaboration, and the captain’s dinner assured to provide funding to take on the process of collaboration in the area under guidance of a project manager in the post-Transform period. However, the partnership was not formalized in a legal entity and citizen participation is not really pursued, which causes these two pillars for collaboration to be shaky to build on.

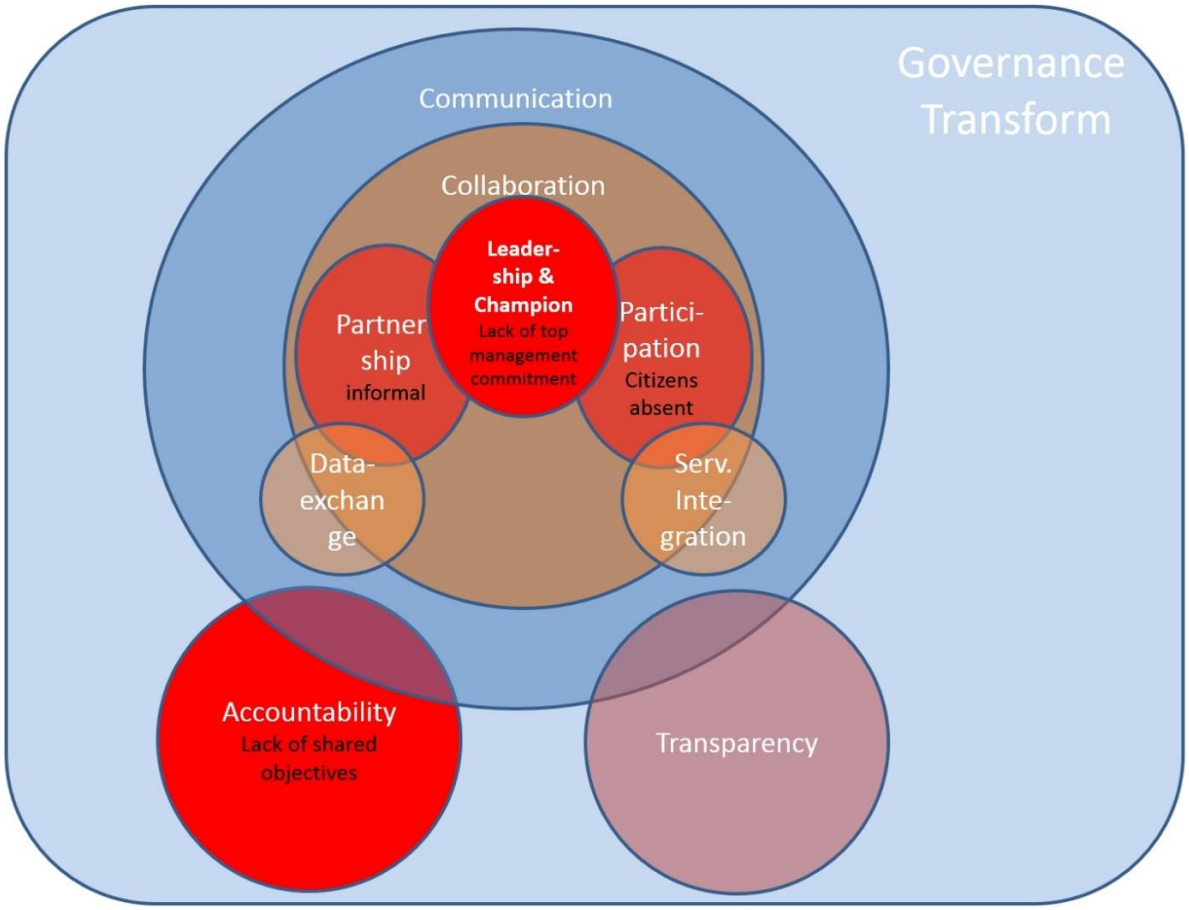


Figure 9.1 The main problematic governance aspects of Transform (in orange)

Other main findings concerning leadership are that the EU as a sponsor cannot fulfil the role of main client. In a traditional situation the client has defined the need and objectives, and steers on relevant aspects as timelines, budget and quality. In the EU-projects the EU steers on timelines and budget but not in an integrated relation to the desired outcome and quality. Not having a main client results in a lack of guidance on the development activities and a lack of quality control on the final deliveries. The external funding has some negative impact on the involvement of top management. Since these managers do not decide on the financing of most activities, they are not necessarily involved in the decision-making. Top management not being adequately involved leaves too much room for policy makers and results in too little emphasis on the resources and capacity needed to really implement change in the city.

The external funding even has some negative effects on the behaviour of the partners. Because of the available funding, the execution of activities becomes more important than the optimal planning and coherence of targeted results. This situation could only continue because the leadership culture was more process-oriented than result oriented, and the commercial drive of partner organizations was not aligned with SMART project objectives.

Another, more general disturbing element is that the chosen domain 'Energy' is very complex, and that the partners involved had little knowledge about it. Changes in this domain ask for a long-term commitment, which does not fit well with the time frames of EU-sponsored programs. The relations between the different main barriers found are shown in the figure below.

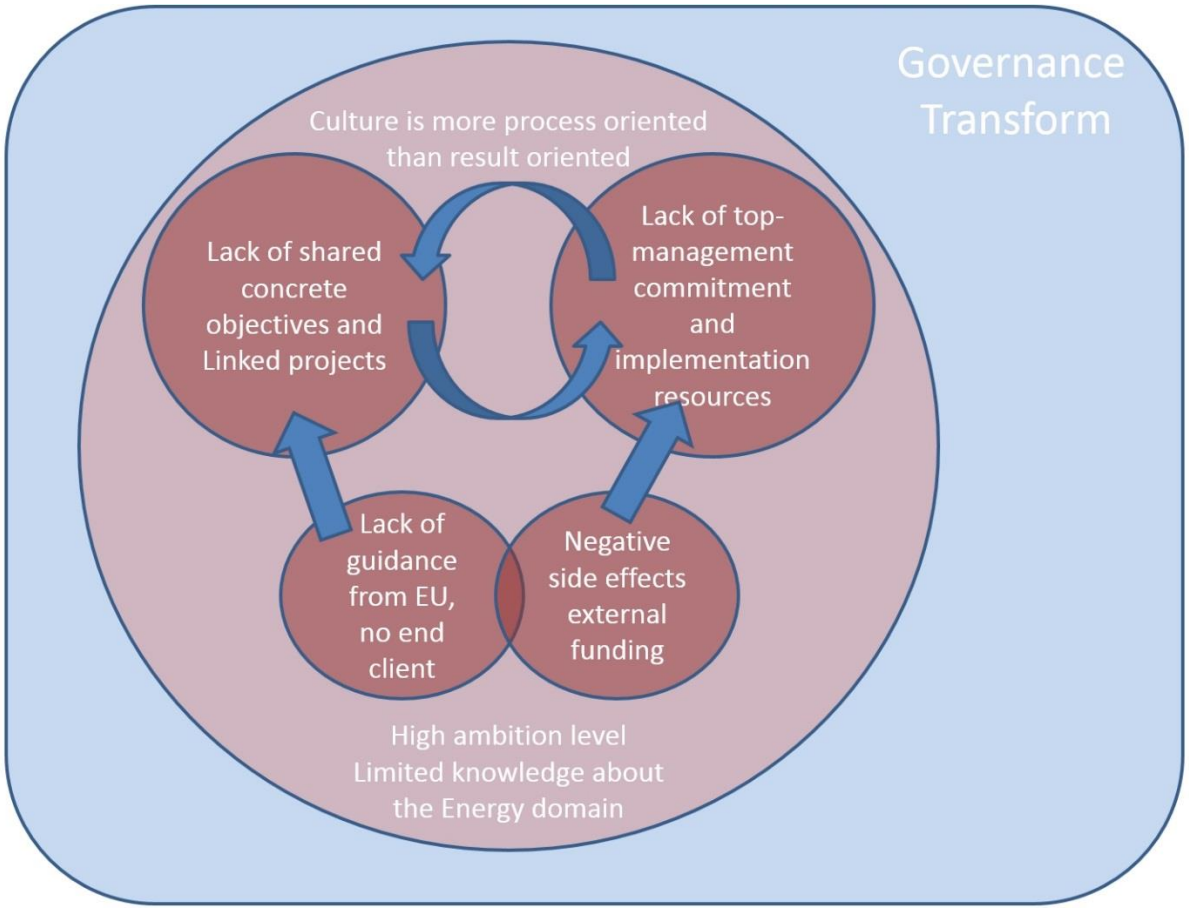


Figure 9.2 Relations between governance barriers found in the Transform project

These governance barriers might not only be specific to Smart City implementation. The difficult link between high-level ambitions (e.g. reducing CO2 emission to improve the quality of life in the city) and the needed operational projects and actions in a complex environment (Energy) is a typical Smart City phenomenon. The other barriers are related to complex collaboration in an externally (EU) sponsored program, and can also play an important role in conventional urban area development.

Van Warmerdam supports these conclusions, and adds to it: “I think we should create a new type of platform, a new kind of ‘company’ in which important stakeholders like housing corporations and energy suppliers, investors and scientific expertise are involved. This platform should be able to offer the needed leadership and holistic vision, with clear targets (KPI’s), investments and a clear long-term vision.” (International Coordinator R. van Warmerdam).

9.2 Conclusions Triangulum

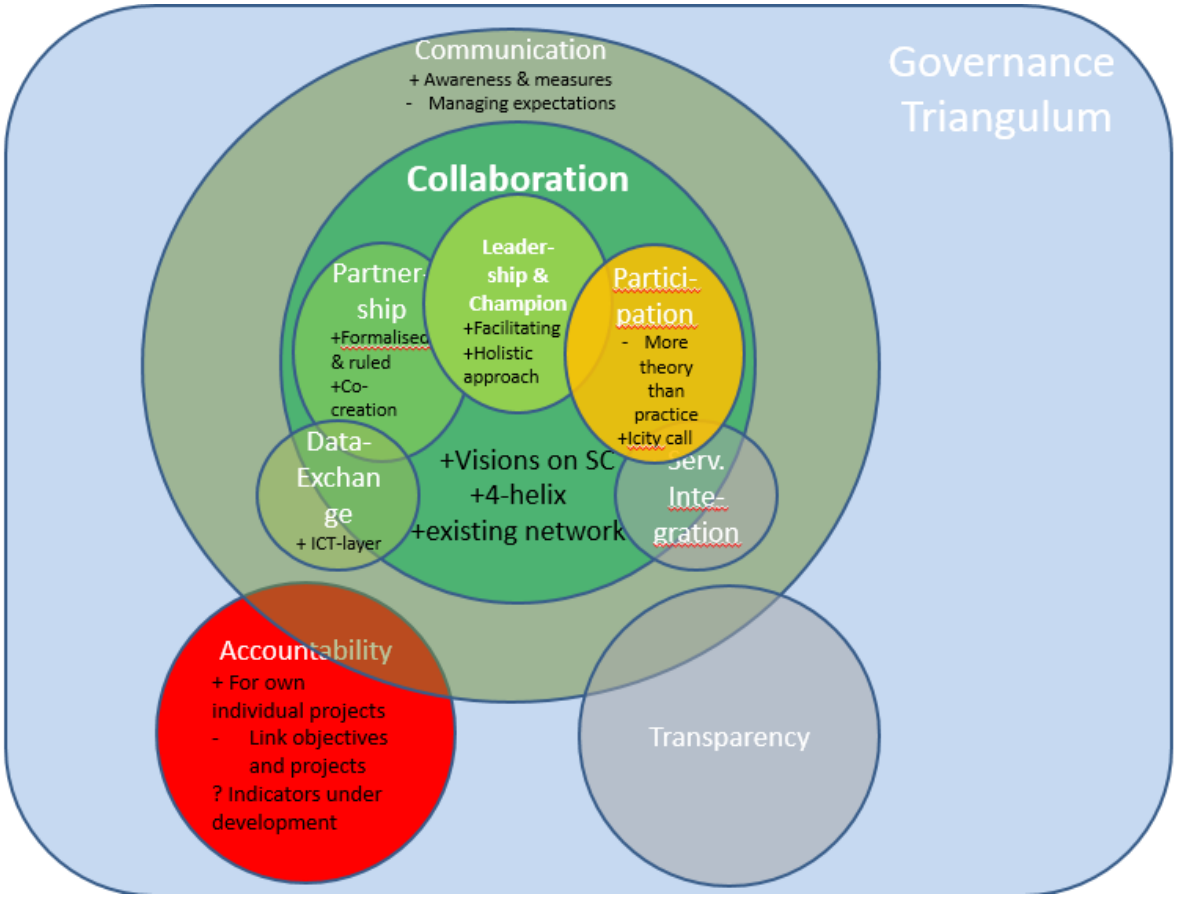


Figure 9.2 The main problematic governance aspects of Triangulum

Since the Triangulum project is not even half way it's planned lifetime, it is hard to formulate conclusions concerning the project, without having any idea about the final results. This means that the conclusions have only respect to the first phases of the project and the build up organization.

Prior to the Triangulum project, the city of Eindhoven showed leadership, especially the mayor was a 'champion' in pushing the 'Smart' agenda. During Triangulum, the governance in the project can be described as having a dedicated partnership who are transparent in their communication and about their accountabilities from the start. The partnership is led by the municipality in a facilitating way, but each project has different partners in the lead, making them accountable for the implementation. Collaboration is less important within these projects, because the work is already divided. Many projects are still leaning on public participation and data exchange to succeed.

Participation is central in Eindhoven's vision of a Smart Society but in practice it is hard to realize and most projects are realizing ideas from the stakeholders. The Icity call can contribute to enlargement of the participation.

The formed partnership is built on partners who developed a Smart City vision themselves, transparent in their communication and about their accountabilities from the start. Each project has different partners in the lead, making them accountable for the implementation. Collaboration is less important within these projects, because the work is already divided. A major risk for these projects is that they will not profit optimal form synergy between different partners. Many projects are still leaning on public participation and data exchange to succeed.

Communication between the partners seems to develop well. Communication with the community is an extra point of attention to manage realistic expectations of the outcomes of Triangulum.

Accountability and Transparency could become points of attention in the near future, but it is too early to be able to draw conclusions on these sub-processes.

During the 5 interviews the interviewees made 101 statements on the governance factors. Most of the attention is drawn to the first three factors with less attention for the Leadership. The interviewees confirmed – sometimes very explicit – that the factors are presented in order of importance. One interviewee puts Transparency on top of the list, stating that "it all begin with transparency".

The interviews confirm that also in Triangulum Governance is mainly experienced as a mixture of collaboration, leadership, partnership and participation. The presence of the other factors is less dominant.

The interviewees experience the Triangulum project as a positive experience with a clear dominance of signalized success factors, some neutral statements and almost no barriers. Since the project is almost half way and performed in a positive atmosphere, expectations are still high and it may be difficult to determine possible fail factors yet.

Conclusions from the interviews

- Interviewees present many success factors hardly any barriers
- The project is not yet half way, the climate is very optimistic with high expectations, no time yet for possible disappointments
- Psychological clear that potential and unsolved barriers will be discussed internally and in this state not with an outsider doing research; the Transform case shows that a more balanced insight in success factors and barriers will probably be developed after finishing the project

	Governance aspect/ nr statemen	Triangulum	%	SF's	Factual	Barriers
1	Collaboration	33	33	22	2	7
2	Leadership & champion	13	13	8	5	0
3	Participation & Partnership	26	26	19	4	3
4	Communication	7	7	6	0	1
5	Data-exchange	5	5	2	1	2
6	Service & application integration	7	7	4	2	1
7	Accountability	4	4	4	0	0
8	Transparency	6	6	4	0	2
	total statements	101	100	69	14	16

Table xx Division of statements from the interviews

9.3 Conclusions concerning the theory of governance factors

The eight governance factors that are found to be relevant in the literature have also been found in the case study:

1. Collaboration
2. Leadership and champion
3. Participation and partnership
4. Communication
5. Data-exchange
6. Service and application integration
7. Accountability
8. Transparency

To develop an idea of the relative importance of the different governance factors I have counted the statements from researchers in paragraph 4.3 about success factors and barriers per governance factor (marked in green and red in the text, see also Appendix IV).

The statements of the interviewees in both cases are categorized within the eight governance factors and linked to the factors they are most related to. The resulting table with absolute figures and percentage numbers shows how the attention in the cited literature and the case study is divided over the different governance factors, based on the quantity of the statements. This way each statements is equally valued, and the differences in impact are ignored, since they are not measureable within the context of this thesis.

	Governance aspect/ nr statements	Transform	%	Triangulum	%	Literature	%
1	Collaboration	45	32	33	33	16	19
2	Leadership & champion	43	30	13	13	14	16
3	Participation & Partnership	24	17	26	26	16	19
4	Communication	4	3	7	7	8	9
5	Data-exchange	10	7	5	5	17	20
6	Service & application integration	2	1	7	7	7	8
7	Accountability	8	6	4	4	5	6
8	Transparency	5	4	6	6	3	3
	total statements	141	100	101	100	86	100

Table 9.1 Division of statements from the interviews compared with statements from the research literature (based on chapter 4.3).

The top three governance factors found in the literature (collaboration, leadership & champion, participation & partnership) are also apparent in the case interviews; there is a focus on the aspect of ‘collaboration’ in both cases, other factors seem to be less prominent. No new governance factors have been signalled, and the relevance experienced in the cases supports their current order based on the research literature. One could argue to shift places between the ‘leadership & champion’ and ‘participation & partnership’ since there is more attention to the topic of partnership and participation than the issue of leadership in Triangulum. This can be a cultural issue, since in the Dutch ‘polder-culture’ -where decision making is mostly based on intensive consultation and negotiation between involved parties- there is more support for ‘shared leadership’ than for a strong figurehead. The factors communication and data-exchange were less prominent in the cases than

expected based on the literature. Accountability and transparency are less prominent in theory and practice. Of course this does not mean that they are addressed enough. To my idea the impact of these factors is underestimated in theory and practice. One interviewee of Triangulum specifically mentions transparency (and implicitly accountability) as the main critical factor for successful Smart city implementation: “If you aren’t transparent from the start, than along the way you will bump into expectations which are not manageable anymore . . .” (J.Hijdra From Woonbedrijf).

No new relations between the governance factors are found besides those already expressed in the governance model.

In the finalized Transform case, I see a balance between experienced success factors and barriers. Most success factors and barriers found in the research literature (see paragraph 4.3) are recognized in the cases.

In the ongoing Triangulum project respondents focus on the success factors—not many barriers have been experienced or mentioned. Of course this can change in the future, depending on the extent to which objectives are realized by the stakeholders and the transparency of the results.

All the interviewees encountered a number of success factors and barriers that are identified in the literature. Mainly from the Transform project, a number of success factors and barriers were encountered that did not explicitly occur in the analysed literature.

1. Collaboration

- Success is largely dependent on the extent to which stakeholders have existing relationships to build on. This statement is made on the basis of the Energy Atlas in Transform for which Liander already agreed on delivering the data, and on the exiting collaborations in Triangulum. Building relations takes time and effort, and needs trust and openness (Transform/Triangulum);
- External funding by a third party (like the EU), with largely payment in advance is a risk for it can stimulate extrinsic motivation, where declaring working hours and costs is more important than the optimal contribution to a specific goal; It can be demotivating to work on the program. This requires extra attention for a decent business case, good project organization, setting clear objectives and planning of activities and a vision on the post-project situation and responsibilities (Transform) This risk is not notified by Triangulum partners;
- Sudden funding changes can cause issues in the planning of the project (Triangulum)
- Over-ambition is a real threat: a too complex subject (co2 reduction/sustainability) with too many (Commission)(Commission)(Commission)partners in different local situations, with little knowledge of the (energy) domain, lacking a good selection process for the employees from different partners, can never be fully successful (Transform).
- For synergetic collaboration different types of people are requested, for example with a process and a product orientation, making sure that the way of working together gets enough attention and that the energy is focused on concrete creative solutions. Entrepreneurial ‘Business developers’ are mentioned as example (Triangulum);
- Intensive lab sessions and design thinkers meeting helps to stimulate collaboration (Transform);

2. Leadership

- Having a pro-active municipality writing calls for European projects pays off. It helps having insiders in the European Commission/Parliament who can promote or tip about upcoming programmes (Transform/Triangulum);
- External funding reduces the need to involve CEO-level managers of the stakeholders, keeping the initiative on a distance of the core activities with an additional post-project gap (Transform);
- Get all levels involved from the start (Operational, Tactical and Strategical level) and besides policy makers also include 'hands on' implementation specialists. Top level commitment is critical from the start (Transform);
- Define an independent quality assurance unit to monitor progress and to test the results according to pre-defined quality criteria, and who can possibly hold money back until results are qualitatively satisfying (Transform);
- Include 'Iconic leadership', by involving stakeholders in the process who have specific goals and ambitious targets, and are able to translate these goals into concrete actions, like the Amsterdam Arena who has become CO2 neutral (Transform).

3. Participation & partnership

- Participation can have its limitations, especially when responsibilities and risks are getting involved. The municipality has chosen not to involve citizens, but rather focus on businesses as partners. They realised that organizing public participation would not have a great impact towards implementation of Smart City projects. Especially in the energy domain, the private parties and municipality are in control. During the planning of projects an implementation 'power modelling' (p.120) should be made of the involved actors (Transform);
- Select partners with a sustainable interest in the area who will keep investing in the area for a long time and for whom the transformation and implementation activity is important for their branding and public relations. Select stakeholders that are intrinsically motivated embracing shared objectives, like Accenture where the CEO was pushing for a sustainable world and the Amsterdam ArenA who wanted to be climate neutral in 2015. Or like Liander who already joined the ASC, thus being in the smart city mind-set and open towards sharing data (Transform);
- Organize the needed dedicated resources to make progress and don't lean on employees who 'do it on the side' (Transform).

4. Communication

- Stakeholders use different terms and expressions, a shared glossary has been a useful tool to prevent misunderstandings. In Triangulum, for Strijp-S a Smart City vision document is created to promote goals and objectives and their strategy for the area. In Transform a communication document is provided on different terms and definitions. These document contribute to shared understanding. However, many interviewees note that miscommunication between people from different sectors needs people to be patient. "Everyone needs to realise and be aware of the fact that they are working in different contexts, which can lead to misunderstanding", according to Van Dieren (Transform/Triangulum).
- People are talking at cross purposes: There are new players in this Smart City market from different fields, it is a new discipline for collaboration. We need time, patience, and understanding towards each other in the process of building a common language (Triangulum).

- Make sure to include a ‘sound board’ on the CEO level, to secure the level of involvement and the intention towards the project execution (Transform)

5 Data-exchange

- Issues are related to privacy and willingness of citizens or companies to share information. When (Transform/Triangulum)
- Sign special ‘documents on privacy’ to guarantee the type of usage of the shared data helps to commit citizens. Create a ‘trusted’ party of which the citizens are owner (Triangulum).
- The systems exchanging data, should be closed systems working together, improving service integration, ‘Fi –ware’ (a core platform for the future internet) can help with this (Triangulum)
- A base architecture form of data should be developed, so data can be compatible for different usage and exchange, thus creating a digital communication code (Triangulum)

6 Service application & integration

- Create demonstrable cross overs between branches to help people think of innovative possibilities. Show that collaboration can lead to service application and integration by realising ‘low hanging fruit’ projects (Triangulum/Transform).
- Setting up a Board of Smart City in the municipality can help integration of services, in which bi weekly or monthly meetings are scheduled to discuss progress on this theme (Triangulum)

7 Accountability

- Include ‘project leadership’, by making certain stakeholders accountable for the lead and implementation of specific projects (Triangulum).

8 Transparency

- Projects fail because of lack of entrepreneurialism. Innovation always involves risk for the stakeholders involved. Transparency about new business models, can mean that projects have to be abandoned after testing phase (Transform);
- Transparency is critical in the starting phase. When signing up for a consortium or collaboration, everyone has to be clear about their objectives and regulatory procedures. If this does not happen at the start, unmanageable problems will rise on the road towards implementing Smart City projects (Triangulum).
- Results towards the EU need to be transparent, in order to improve the funding system. For example "Energy Atlas” key in open data exchange and in getting insight in the energy usage of a city (district) (Transform).

Impact on the definitions

Based on the newly found success factors and barriers in the case studies, some of the definitions for the respective governance factors can be made a little more specific. The added elements are given in red.

Leadership and champion, the process and roles on executive level to give guidance to the collaboration, create credibility and trust, help selecting and binding the stakeholders to targeted

results and overcome barriers to maintain an action oriented mode securing the right capabilities in the team and an independent role for quality assurance and monitoring.

Participation and partnership should be seen as two separate sub processes and therefore should have their own definition:

Participation: process to create and maintain participation of citizens

Partnership process to create and maintain partnership between public and private institutions to guarantee optimal involvement of the stakeholders with a sustainable interest in the area and willing to supply dedicated employees.

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Appendix I Smart City frameworks:

I show the most relevant frameworks regarding the research scope, thus including influencing factors in smart city implementation.

As we have seen before many publications stress the fact that Smart City initiatives originate frequently from a technology push with a high risk to neglect other relevant factors. According to Nam and Pardo (2011) the Smart City concept is an organic connection among technological, human and institutional components. However, like Mora (2015), they state that not technologies, but social factors are central to failure or success of smart cities (Nam & Pardo, 2011a). To illustrate this the simple iceberg metaphor is used to express the risk of neglecting these critical factors.

Figure XX Managing smart city strategies: technology and other factors smart city implementation (Luca Mora, xxxx)'

In the same line of thought is the model presented by Nam and Pardo (2011). The model identifies three core factors of influence to countervail the pre-dominant focus on technology: institutional, human, and technology factors. Due to this mix of influencing factors, according to Nam and Pardo (2011) *"a socio-technical view on smart city is needed"* (Nam & Pardo, 2011a). These three components are influencing the six characteristics of a Smart City, which can be seen as objectives for the Smart City initiative but at the same time as strength or 'smartness in certain areas'. These characteristics match those defined by the EU (European Union, 2014).

Fig XX The relationship between components and characteristics of Smart City (bron….)

Dimension	Innovation How can we change the way government delivers service?	Risk What are risks from innovation?	Way to Success How can we deal with risks while innovating?
Technology (to serve as a tool for innovation)	▪ Leveraging transformational potentials of advanced ICTs	▪ Lack of knowledge ▪ Incompatibility ▪ Too much hope ▪ Security	▪ System interoperability ▪ Integration of systems and infrastructures
Organization (to manage innovation)	▪ Enhancing efficient, effective management (front-office and back-office) ▪ Improving interoperability within or across organizational boundaries	▪ Organizational conflict ▪ Resistance to change ▪ Misalignment between goals and projects	▪ Enterprise interoperability and business modeling ▪ Cross-organizational management and managerial interoperability ▪ Leadership
Policy (to create an enabling environment)	▪ Redesigning relationships between government and actors ▪ Policy experiment	▪ Inconsideration of multiple stakeholders ▪ Political pressure ▪ Conflict with other policies	▪ Policy integration ▪ Marketing ▪ Governance ▪ Collaboration ▪ Partnership
Context	▪ Physical dimension ▪ Environment		▪ Consideration of context

Fig XX Fig. XX Framework of Smart City innovation

From this *socio-technical* viewpoint, Nam and Pardo (2011) focus on the Smart City as Urban Innovation. They provide a Framework for Smart City innovation, which shows *four dimensions* (Technology, organization, policy and context) in relation to *ways to change the government service delivery* (innovation), *related risks* (Risk) and *ways to deal with this risk* while innovating (way to success). These *ways to success* are generic and

vague solutions and recommendations, as 'governance' is the way to success. How this governance should be implemented is undescribed. They do propose the need for system interoperability, integration of systems and infrastructures, cross organizational management and managerial interoperability, leadership, policy integration, marketing, collaboration, partnership and consideration of the context. However, finer detail on how to deal with these sub success factors is lacking. They do stress the strategic directions of a Smart City for Technology factors is *integration*, for human factors is *learning,* for Institutional factors is *governance*.

Walraven (Walravens, 2015) expresses the importance of a holistic view on the Smart City concept and therefore puts the accent on three so called characteristics 'Collective' (aiming to tackle grand societal challenges), 'Contextual' (making sense out of the data flood) and 'Collaborative' (working with all stakeholders, including citizens, using open innovation methods).

In an attempt to write a definition for the Smart City Dameri (2013) has produced two models defining the essential elements of the concept. A pyramid model showing the development path for top-down and bottom-up initiatives, and a circular comprehensive schema suggesting a kernel and flow. The pyramid model underlines the key influence of Governance, located at the top and its direct relation to vision, policy and rules. In this model Governance and vision seem to be a final stage in the development path.

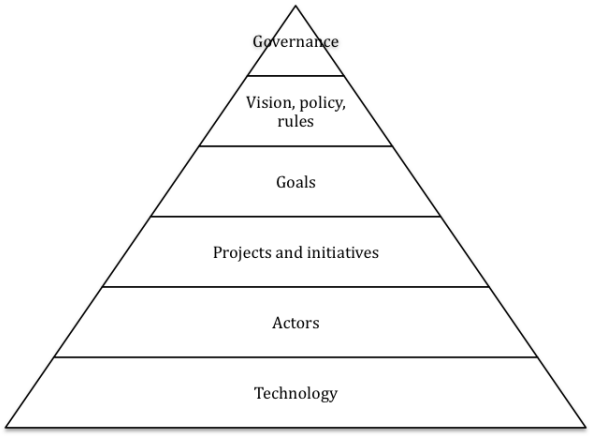

Fig. XX Bottom-up smart city development path(

The circular model emphasizes Governance as core factor of the smart city initiative, together with citizen, land and technology. These factors work together within a certain scale towards one or more objectives in the outer circle (well-being, participation, intellectual capital and environment). These objectives are seen as mutually influencing factors with a causal relation. In this model the land factor relates to the physical urban aspect of Smart City development. In both the comprehensive scheme and the development path of a Smart City, Dameri gives a central role to governance.

Fig. XX Smartcity comprehensiveschema (Dameri

XXX present a different framework to define a Smart City initiative. Central in this model are the high level objectives to address like improvement of the quality of life. In the first shell intermediate objectives are placed. The realization of a specific set of these intermediate objectives, like for example Social Development and Economic growth, will contribute to the realization of the high level objective(s). Relevant subsystems are gathered in the second shell. These subsystems are the building blocks of the urban society. They can become 'smart' by themselves and contribute to the success of a Smart City initiative. The relevant stakeholders

involved are gathered in the third shell, making clear that a Smart City initiative is a complex arena because of all the different persons and institutions involved, with mostly their own vision, expectations and interest. The framework presents a slightly more detailed insight in relevant factors that influence the smart city initiative. In this model the four factors on the right (purple) can be seen interpreted as governance factors, namely integration of sub-systems, Applying ICT in services and integration, investment in social capital, collaboration of stakeholders. As Adam puts it: "Encouraging civic participation and investing in social capital… means investment in more efficient and responsive governance" (Adam, 2007).

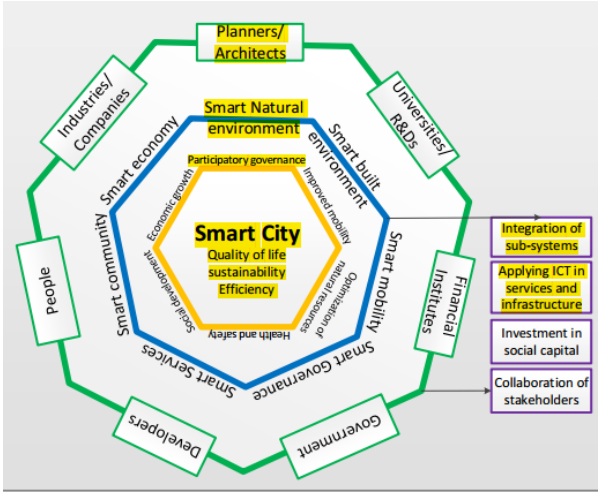

Fig XX

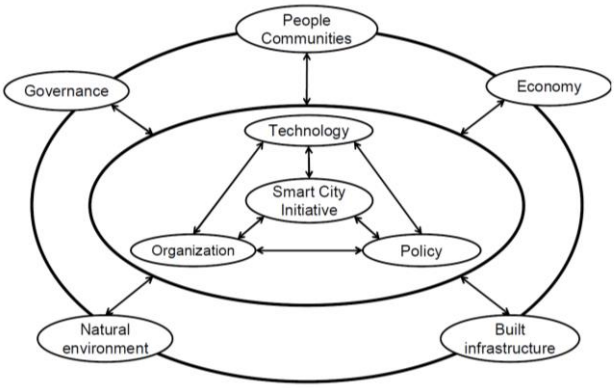

Figure XX Understanding Smart Cities: An Integrative

(1) management and organization

Original paper: Based on E-government success factors and barriers for M&O: Project size; Manager's attitudes and Behaviour; Users or organizational diversity; Alignment of organizational goals and project; Multiple or conflicting goals; Resistance to change; Turf and conflicts; Project team skills and expertise; Well-skilled and respected IT leader (tech-social skills); Clear and realistic goals; Identification of relevant stakeholders; End-user involvement; Planning; Clear milestones and measurable deliverables; Good communication; Previous business process improvement; Adequate training; Adequate and innovative funding; Current or best practices review.

Main findings M&O: The role of a leading organization is essential, managing involves interdepartmental collaboration, the initiatives change organizational culture and vice versa, the role of the top management and leadership is critically important, limited funding continues as a major challenge.

(2) technology

Original paper: The integration of ICT with development projects can change the urban landscape of a city and offer a number of potential opportunities, they can enhance the management and functioning of a city. City managers should consider certain factors when implementing ICT with

regard to resource availability, capacity, institutional willingness and also with regards to inequality, digital divide and changing culture and habits.

Main findings technology: New technologies for back office functions are used for the initiatives, social media and smart phone are increasingly used, the lack of staff and budgetary constraints are main challenges.

(3) policy

Original paper: Political components represent various political elements (city council, city government, and city major) and external pressures such as policy agendas and politics that may affect the outcomes of IT initiatives. Institutional readiness such as removing legal and regulatory barriers is important for smooth implementation of smart city initiatives. E-government success factors identified are legal, regulatory, institutional and environmental challenges. Smart city initiatives face similar challenges which influence the policy context.

Main findings policy: Interdepartmental agreements shape the policy context, the executives' policy directions shape policy context

(4) governance

Original paper: Governance, involves the implementation of processes with constituents who exchange information according to rules and standards in order to achieve goals and objectives. Stakeholders' relations is one of the critical factors to determine success or failure. "Stakeholder relations" refers to four main issues: the ability to cooperate among stakeholders, support of leadership, structure of alliances and working under different jurisdictions. The recollected factors are: Collaboration; Leadership and champion; Participation and partnership; Communication; Data-exchange; Service and application integration; Accountability; Transparency.

Main findings governance: Various types of governance models and governance bodies exist, governance encompasses programmatic directions, budgetary and resource allocations the interactions with external actors as well as internal partnerships with other departments agencies.

(5) people and communities

Original paper: Projects of smart cities have an impact on the quality of life of citizens and aim to foster more informed, educated, and participatory citizens. Additionally, smart cities initiatives allow members of the city to participate in the governance and management of the city and become active users.

Main findings: Smart City initiatives aim to better understand people's wants and needs, involve citizens, businesses, and other stakeholders, and also improve the citizen-government relationship.

(6) the economy

Original paper: Smart economy includes factors all around economic competitiveness.

Main findings: Smartness in the context of urban economy indicates overcoming economic challenges, creating new jobs and businesses, and increasing regional attractiveness and competitiveness.

(7) built infrastructure

Original paper: ICT infrastructure includes wireless infrastructure and service-oriented information systems. There is a little literature that focuses on ICT infrastructure barriers of smart cities initiatives. IT challenges can be grouped in three dimensions; IT infrastructure, security and privacy, and operational cost.

Main findings: Smart City initiatives develop information and communication infrastructures, and in turn those infrastructures promote smart city initiatives. Smart power grids and smart traffic control and steering are among such initiatives.

(8) the natural environment

Original paper: Core to the concept of a smart city is the use of technology to increase sustainability and to better manage natural resources.

Main findings: Smart City initiatives help create desirable conditions for a livable and sustainable city by preserving and protecting the natural environment, which in turn increases the city's attractiveness and livability (Alawadhi et al., 2012).

Appendix II Living Labs in Amsterdam and Eindhoven

Triangulum Eindhoven

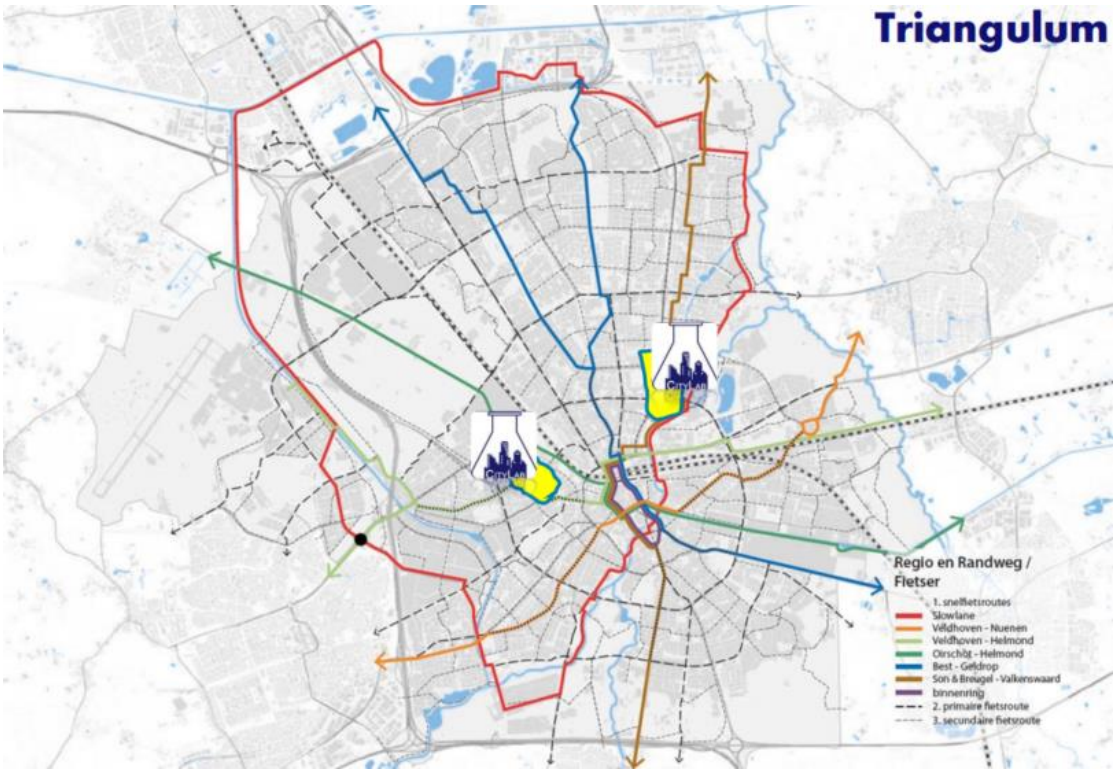

Fig XXX Two city labs Eindhoven: Strijp-S (Lioudakis et al.) and Eckart/Vaartbroek (right)

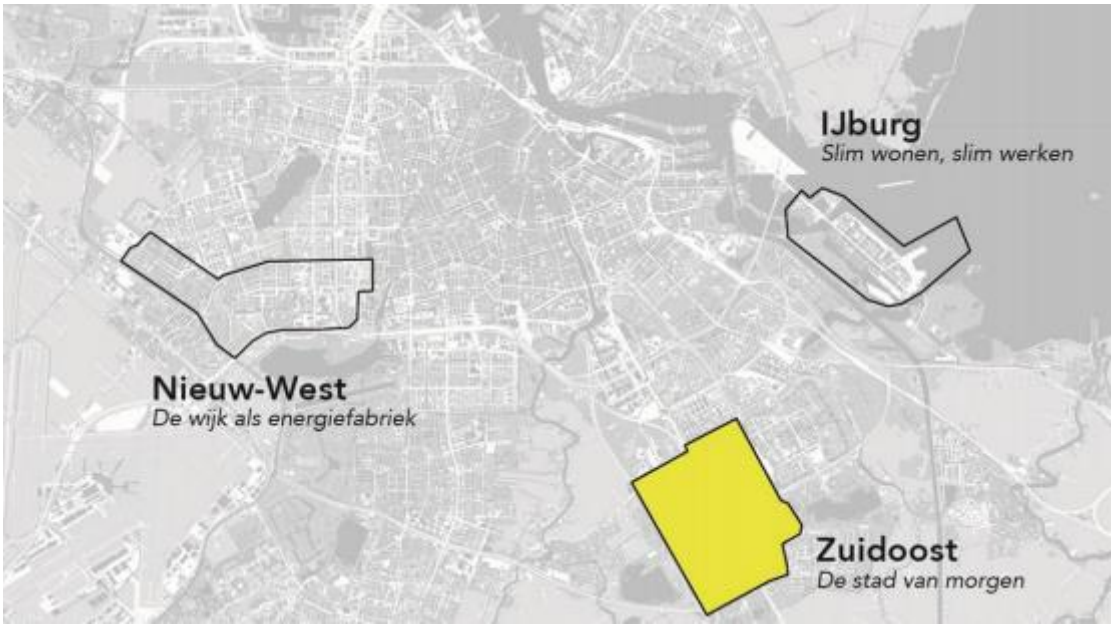

Fig XXX Three city labs, Amsterdam Smart City, with Zuid Oost (yellow) as TRANSFORM lab.

Appendix III The ArenA Solar power project

On the 26th of March on 2014 the first solar panels were installed on the Amsterdam Arena. In May the roof has been completed with a total of 4200 solar panels, covering a total surface area of approximately 7,000 m2.

"The Sustainable ArenA Platform (Platform Duurzame ArenA) – consisting of a team of ArenA employees who are responsible for the realization of the sustainability programme entitled 'Amsterdam ArenA. Naturally sustainable' installed the first solar panels on the stadium roof." (http://www.amsterdamarena.nl/default-showon-page/first-solar-panels-installed-on-amsterdam-arena-roof.html).

Henk van Raan, project manager of the Amsterdam Arena; *"it took a lot of time to make this happen, but we did it! This step takes us one step closer to our ultimate goal of realizing a net climate neutral stadium by 2015."*

"The installation of the rooftop solar system will cost approximately 1.6 million euros and will be executed by a number of Green Deal partners of the ArenA: Nuon, BAM and Arcadis . . ." , "The Green Deal partners support the ArenA in their efforts to achieve net climate neutrality by 2015".

"The Amsterdam Climate and Energy Fund, an initiative of the Municipality of Amsterdam, was launched in October 2013. It is funded by part of the proceeds from the sale of shares in Nuon. The fund provides (subordinated) loans, warranties and/or share capital. In conjunction with the existing Amsterdam Investment Fund, it helps to ensure that the ArenA can install and operate the rooftop solar power system in a cost-effective manner.

On 14 March 2014 the Amsterdam ArenA and the Municipality of Amsterdam signed an innovation deal. Part of this deal is formulating a strategy together focused on smart ICT applications for crowd management, energy grids, connectivity and apps for visitors. This is the first innovation deal negotiated by the municipality with another business.

On 9 September 2009 the municipality signed a Memorandum of Understanding with the Amsterdam ArenA to improve sustainability with goals to decrease energy and water usage, CO2-emissions, waste production, mobility tax. The municipality mentioned the Amsterdam ArenA as an Icon-location on the area of sustainability. Both parties solemnly swore that they would optimally collaborate to make Amsterdam Arena the most sustainable stadium in Europe. The Amsterdam Arena made a five year plan 'naturally sustainable', which states that from 2015, no single gram of CO2 will be exploited by the stadium. In this the Amsterdam Arena is as pilot project part of the 'Green Deal' with the ministry of Economic affairs (signed on 11 November 2015). A second 'Green Deal' has been prepared with stakeholders like Coca Cola, ABN AMRO and BAM. Both these deals are an elaboration of the memorandum of understanding signed in 2009. In this MoU the ArenA intends to invest in projects with a payback period of 10 years and the Municipality intends to (financially) support their goals. For example by a 'revolvement fund' with which partners can loan interest free.

This was an exclusive partnership between the municipality and the ArenA, because it was the only (of 8) MoU in which the municipality stated to contribute financially.

This lead to questions in the B&W on how the financial obligations would be met, and how the municipality would be accountable. The college van B& W see the ArenA as "an important example, not only for the visitors and companies in the area, but due to the national exposure, also on a

national level". A sustainable ArenA contributes to a positive image of Amsterdam, which also is the reason why the Municipality whole heartedly signed the 2009 agreement.

Henk Markerink of the Amsterdam ArenA found it necessary to collaborate with partners to realize innovation: "We want to collaborate with the Amsterdam Economic Board and the Amsterdam Smart City (ASC) in realizing innovation". Collaboration with municipality and knowledge partners

From another source http://www.naturallysustainable.nl/energy:

The decision to install solar panels on the non-moving part of the roof did not materialise out of thin air:

> We had considered it before, but it was hard to build a strong business case. The project was finance by the Amsterdam Climate and the Amsterdam Investment Fund. This took us one step closer to installing the rooftop solar system. The fact that we were granted a subsidy under the SDE (Renewable energy Production Incentive Scheme) made the envisaged return period feasible. Then, our Green Deal partner Nuon could make purchases at competitive prices. (http://www.vanzelfsprekendduurzaam.nl/energie/4)

According to Van Raan it was high time for tangible results: "In the past few years, we have taken many measures, most of which were not immediately apparent. Installing the solar panel roof turned this around and made our efforts visible." Thus generating more than electricity "it helps energise and inspire people"http://www.vanzelfsprekendduurzaam.nl/energie/4)

> I get phone calls every week asking me how we managed to do it. That's why we decided to leverage our knowledge and experience to enhance the sustainability of the Southeast District (Zuid Oost). At the Captain's Dinner, the gathering of big companies from the region unanimously applauded this ambition. And we hope that a visit to China's largest solar panel manufacturer, as part of Amsterdam's trade mission to China at the end of 2014, will help us further along the path towards our goal of solar power for the entire urban district. (http://www.vanzelfsprekendduurzaam.nl/energie/4).

The alderman responsible for sustainability, Abdeluheb Choho, stated to be glad to be able to support ArenA in realizing their ambitions "enhancing the innovative qualities of the city and inspiring other businesses and residents to start up their own energy project. In all these sources RANSFORM hasn't been mentioned at all, however, the mentioned Captain's Dinner underlines ArenA's leadership role in this area.

As Green Deal partner of the ArenA, Nuon states "commitment to sustainability is an excellent strategy to maximize brand awareness, and Nuon is more than happy to contribute to this".

On monitoring: The ArenA is equipped with an advanced building management and control system for maximum energy efficiency: "Saving energy begins with monitoring", according to Van Raan. Twice a day power consumption is monitored, increasing awareness and control, and motivating changes in behaviour in a positive way.

Appendix IV Barriers and Success factors

To be included