

Facilitating Multi-Stakeholder Engagement for Smart City Development

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<p>In this research, the author explores smart city concept and analyses the development of cities globally. As there is a lack of common understanding between the cities, industries and civil society, about the possible transition towards a smarter and more sustainable ecosystem, author explains the key evolutionary stages and action fields that have been widely accepted in major smart city frameworks.</p> <p>Acknowledging that each city is unique and the innovation and technological solutions cannot be applied everywhere with the same effects, there is an emphasis on defining the major stakeholder groups that should be considered and involved in the smart city development process, as well as which partnership forms and communication channels can be the most effective. As part of this, open and collaborative innovation strategies are discussed.</p> <p>As the thesis is commissioned by bee smart city GmbH, a global smart city – focused platform, the concept of platform business, and the practical benefits of different types of platforms in the smart city context, are explained in detail. During the research, several international and highly qualitative interviews with city representatives were conducted, and the theoretical insights were confirmed, and enriched by real-life insights.</p> <p>As a result of this study, author has proposed practical suggestions that would make the stakeholder engagement more effective on a platform level, as well as how new processes can be facilitated online and offline.</p>	
Keywords Smart city, collaborative innovation, multi-stakeholder engagement, public-private-people partnerships (PPPP), platform business	

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1 Introduction

As more than half of the world's population lives in cities, and it's even predicted that 90% of future population growth will be concentrated in urban areas (Rosenberger 2018) it's increasingly challenging to solve the citizen needs towards improving their life quality and keep the processes in the cities effective from the operational and administrative perspectives.

As the population is already dense in cities, and increasingly influenced by globalisation, the existing problems may become bigger, and new ones may arise. The relationship between global trends and events and cities is growing closer, meaning that the local impact is also bigger to the economy, demographics, environment and other factors. Despite this, there are many positive things and new opportunities. In order to gain a better situational analysis and act accordingly, the city managers should have an overview of what other cities are doing and learn from the best practices. It can be difficult to do this, besides the day-to-day responsibilities, but increased awareness and continuous generation, as well as sharing of innovative tools and practices is of high-level importance to reduce the negative and promote the positive urbanization processes and make the most of them. (Berone 2018)

Particularly in mega-cities with extremely large population, the development can create "mega-challenges" resulting, for example, in intense problems with power supply, mobility, air quality, availability of necessary resources and more. According to Daniel Weitze, connectivity and system approach in the infrastructure, management and further, is crucial as a foundation for smart cities- making it easy to monitor and control the entire city effectively. (Rosenberger 2018)

The commissioner of this thesis: bee smart city GmbH, aims to reach the goal of "connecting smart city stakeholders and enthusiasts around the globe through [...] online smart city solution network." (bee smart city 2019). The company achieves it by sharing the smart city solutions on their platform, publishing smart city insights and guides, as well as helping the various platform users – cities, companies, citizens etc. to be more knowledge-

able and to connect with each other. It is a fast-growing, global smart city platform for developing more liveable smart cities and intelligent communities. At bee smart city, there are ~1000 registered cities from 170+ countries (45% Europe, 28% Asia & ME, 23% Americas, 4% rest of the world). The platform members include cities, solution providers, universities and the civil society. To indicate the rapid development of the business and growth of interest about smart cities, author notes that during her time in the company from February 2019, there were approximately 11,200 registered members, the platform reached 12,000 members in May and 13,000 members in July 2019. (bee smart city 2019)

Author's interest about smart cities was first ignited by a speech in Riga Business Innovation forum, delivered by Renato de Castro in 2016 and the Smart Cities World portal. Since the beginning of this research, she has been working at bee smart city GmbH and gained insights about the organisational processes, worked with customers and participated in several projects related to the platform development.

The main research problem of this thesis is that there is not yet really an effective way for city stakeholders to communicate easily with each other and to find and implement the best solutions to really foster the transition towards smarter and more sustainable cities. Also, the concept of a smart city can be understood differently and even adjusted to how a specific city sees, what makes it "smart".

As a result of this study, the author will propose incentivization mechanisms to optimise the engagement of the target groups – smart city stakeholders - on bee smart city platform. In the further document, the smart city concept will be explained in detail, in connection with the city transformation processes globally, as well as the application of principles of open and collaborative innovation and platform business. Also, the following questions will be answered:

- What is the most effective way to classify and group the smart city development stakeholders?
- In what ways these groups are engaging with each other and applying open collaborative innovation principles?
- How can the bee smart city members use the platform for effective collaboration and smart city development?

The collection of data will be done by various methods, primarily reading and analysing the available literature that covers topics as smart cities, platform business and open collaborative innovation. The author will also use the insights of her work placement and discussions with the supervisors and colleagues of bee smart city.

Among the key goals it is to explain the processes of collaborative innovation and the stakeholders of smart cities, that will be used as basis for the creative and practical development of ways to facilitate their engagement and help them in achieving their smart city development goals on bee smart city platform. While gaining an overall insight about the smart city development, the author will look at the potential ways in which smart city stakeholders can be categorised and apply it to the bee smart city customers, creating groups and sub-groups.

There will be an analysis of the main challenges and opportunities for the stakeholder groups according to their goals and preferred collaboration methods. bee smart city will be reviewed as a platform, including its currently developed and potential features. The author will combine the empirical insights from related work, as well as use the available statistical data from the platform. Several interviews will also be conducted, to gather feedback and suggestions about the research topic and bee smart city platform, from selected target personas.

From there, the author will move to proposing incentivization mechanisms for member engagement on the bee smart city platform, such as optimised and/or new features, as well as finding ways to apply the principles of behavioural economics to develop the choice architecture on bee smart platform and include potential “nudges”.

To ensure the reliability and validity of the thesis contents, the author will use mainly academically reviewed literature and publications that have been officially approved, comparing the information from several resources. When working on the practical and more creative part of the thesis, it will be based on the previously gathered and analysed theoretical knowledge and practical insights from bee smart city.

To better understand the smart city landscape and current global situation, the author has chosen to compare several studies about the “top smart cities” where, cities are evaluated ranked according to geographical location, size and other factors. Different sources are

compared, as, despite the common topic and similar goals, the research frameworks and criteria for smart cities differ. However, more attention will be given to the multi-stakeholder engagement practices in the cities. Understanding the various related research aspects, the city dimensions will provide a holistic overview about the city vision and evolution.

The research is delimited to clarifying the key smart city concepts and exploring the stakeholder engagement, taking several best practice examples and studies from selected cities worldwide, but without a focus on one specific city throughout the research. Although without intended highlight, more attention is given to the current situation in Europe, as cities have shown growing interest and positive approach to smart city development, and several research papers with regional focus have been used. Also, as the involved parties of this research are from different European countries and bee smart city headquarters are in Germany, a large proportion of its members comes from Europe.

The author won't discuss the details of executing a smart city strategy, but instead review the pre-requisites for it and the role of involved stakeholders – for example, ways in which they can participate in the decision-making and implementation of projects. The discovered actionable forms of multi-stakeholder engagement will be evaluated and, regarding the facilitation of them, bee smart city, as the leading global smart city network and the commissioning party of this thesis, is the prime platform of choice where new features could be tested and implemented. As there have been ongoing and upcoming related projects for new features on the bee smart city platform e.g. implementing the direct communication functions on the platform, structuring the products etc., the author will share the input in the process and describe it further in this document.

To emphasize the importance of the topic choice being “Facilitating Multi-Stakeholder Engagement for Smart City Development” the development of smart cities typically includes several stakeholders that collaborate in order to achieve their set goals and open collaborative innovation is recommended when the scale of projects in a city is so large that without collaborative efforts, it would not be effective or cost efficient. The key actors in collaboration for smart city development can be divided in several ways. One of these is, for example, by the initial needs or input: such as smart solution providers, solution seekers, as well as those who simply want to learn and be informed. Often, public-private partnerships

are recognised as effective for making impactful decisions and fostering the city's development, and often, the importance of including the society – people in the process is mentioned in research. Another way to group the stakeholders is by their active role and status which can be for example: city, company, citizen or a research institution. In this case the four groups form a Quadruple Helix model, which is often used for describing knowledge-based development and related to open innovation. It is applicable for knowledge management and co-creation practices between the society, industry, academia and government. (Boyes 2018)

2 Defining Smart City

In the media, the smart city concept is widely used and often understood as closely related with the development of new technologies, although from a historical perspective, the scientific approach for studying cities and optimizing the management is not new. (Al-lam & Newman 2018) Since “smart city” is something that keeps constantly developing over time, now, in the early 21st century, it is in many ways connected with digital technology, big data, Internet of Things (IoT) and related innovative solutions that can be applied in cities. However, technology itself doesn’t instantly make a city “smart”. One of the core methods used to help cities be more effective in development and achieve their goals, is forming partnerships between several stakeholders. Also, open innovation is applied in many cases, as the scale of projects in the cities can be rather large and otherwise not as effective or cost efficient. (Boyes 2018)

Interestingly, although in 2018 Toronto was among the top 50 smart cities globally, a case study there showed that even through several discussions with local stakeholders – between private companies, citizens, and public officials, an agreement could not be reached, to define what “Smart” should really mean in the city context. (Eden Strategy Institute & ONG&ONG Pte Ltd 2018).

While there isn’t one single definition for what a “smart city” actually means, since each city is unique and would need to develop a custom strategy towards becoming a “smart” city, there are some process steps that can be followed to make it easier, and cities can certainly learn from each other and share the best practices. This is where platform approach and open sharing innovation practices become more important, as it would likely require a lot of time, effort, financial and other resources to conduct a full analysis of the city, do a research about the potential solutions and create a sustainable strategy on its own. While there is information about smart cities, that is generally available to everyone, cities typically require external support and expertise in the process. A very important factor here is governance – understood as the collaboration between different stakeholders in decision-making processes – in a state, city, organisation, or other level. In many emerging strategies, special focus is on administrative efficiency and interoperability, improvement of services and citizen-centric approach as added value. (Pereira et al. 2018)

It can be argued that being “smart” is not about the size or the urban or rural geographical structure, and a community can be smart as well, in its ability to create solutions, overcome challenges and pursue innovation. Often, the transformation towards a smart city – or community, is a sum of smaller initiatives and the collaboration of private and public actors across several fields of action, rather than following a master plan or a single technology partnership. (Gorynski 2017) However, to analyse the term more in depth, it’s useful to start by looking into what a “city” means, and a simple definition that the author found to be suitable to this context is that it’s “a relatively large and permanent settlement”. Cities are generally seen as important contributors to economy, education, science and other fields – and are required to fit new roles and take care of demanding responsibilities. Paul R. Brown has stated that “Cities are complex ecosystems that are dependent on natural systems, challenging our thinking about the development of both natural and urban environment”. (Madakam 2014).

Moving on to what a “smart city” really means, it’s important to note that, by replacing “smart” with other words like “digital”, “intelligent”, “future”, “ubiquitous” or “virtual”, the perspective of a city can change very much and while the mentioned adjectives are closely related and sometimes even used interchangeably, “smart city” is considered as the most more user-friendly among these. There are interpretations suggesting that “smart” is by default also “intelligent” and it is better for marketing purposes, as the other terms are less inclusive. (Albino, Berardi & Dangelico 2015)

Let’s compare a few definitions that have been created by authorities, including researchers and industry experts.

Thomas Müller, the Co-Founder of bee smart city GmbH has provided a rather simple and generally appealing definition as a starting point, stating that “*A smart city is an ecosystem of people, processes and solutions. The most important driver of success is collective effort – the sum of many individual actions taken in pursuit of a shared goal.*” (in Barlow & Lévy-Bencheton 2019)

The European Commission has defined a smart city as “a place where traditional networks and services are made more efficient with the use of digital and telecommunication technologies for the benefit of its inhabitants and business.” Beyond technological solutions, it also means a responsive city administration that involves citizens and addresses

the needs of most social categories and groups. (2019) This also correlates with the ecosystem approach where people share collective efforts and the processes and solutions respond to achieving common goals. (Barlow & Lévy-Bencheton 2019)

A slightly shorter and perhaps more contemporary definition would be “Concept of a Smart City where citizens, objects, utilities, etc. connect in a seamless manner using ubiquitous technologies, so as to significantly enhance the living experience in 21st century urban environments” (Northstream 2010) And, a similar definition to the previous one, combining the technology and social aspects follows as: A city connecting the physical infrastructure, the IT infrastructure, the social infrastructure, and the business infrastructure to leverage the collective intelligence of the city. (Harrison et al 2010)

As can be seen, these definitions have a strong focus on the development of innovative technological solutions, as well as the approach is very citizen centric. Lastly, I would like to add a longer and more explanatory definition which includes specific aspects of global importance at the moment, and is, perhaps reflecting the concrete steps that cities are making towards becoming more “smart”: *A city is smart when investments in human and social capital, traditional infrastructure and disruptive technologies fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance. Smart cities emerge as the result of many smart solutions across all sectors of society and combine changing human behaviour with the use of data and innovative technology.* (van Dijk et al. 2015)

Perhaps one of the key reasons why there is no general agreement about the term “smart city”, is that the term is used across industries and usually emphasizes one of two “domains” – the “hard” one focusing on things like infrastructure, mobility, environment and Information and Communications Technology (further ICT) solutions, and the “soft” one focusing on culture, policy, education and aspects that don’t necessarily involve ICT. (Albino, Berardi & Dangelico 2015)

The advantages of a truly developed city are that the services are easily accessible for those in need, citizens can actively participate in governing the city and there is a dynamic, engaged social community. Factors like safety, mobility, economy and others, affecting the quality of life also are very relevant and require sustainable solutions. There are many research papers, articles, presentations and other materials available about the process of becoming a smart city and contributing factors – but they don’t always share

the same approach and even the contributing factors - smart city indicators, can be divided in several different ways.

Most of the existing research acknowledges that smart cities are multidimensional and, according to Boyd Cohen, there are six main “smart” dimensions or fields of action: Mobility, Economy, Government, Environment, Living and People (Cohen 2013). The smart city strategy and actions then, are about innovating the urban environment to improve the six dimensions. (Pereira et al. 2018)

These six “smart” dimensions have been recognised by bee smart city and accepted by several other researchers as well and, to briefly explain each of them:

- **Smart Economy** – includes market innovation, business climate and competitive-ness. It’s enhancing the city’s attractiveness for start-ups, investors, and international businesses.
- **Smart Mobility**- deals with the infrastructure and is aiming to provide increasingly efficient and qualitative transportation. This means more affordable, faster, and environmentally friendly solutions for public and private transport, as well as adopting new forms of transportation.
- **Smart Environment** – is about improving the quality of built and natural environment. Sustainability and resource management - reduction of waste and emissions are some of the sub-dimensions.
- **Smart People** – encouraging creativity and social capital and transforming the way citizens can effectively communicate with the public and private sectors.
- **Smart Living** – means work with culture and the life quality, improving the social and digital inclusion, engagement. This includes optimizing the living environment conditions and overall safety and introducing new technologies.
- **Smart Governance** – is mainly about strengthening citizen participation and empowerment, increasing transparency and collaboration between all stakeholders - citizens, businesses, academia, organisations and others.

(Madakam 2014; bee smart city 2019)

Within the framework of the six smart city dimensions, a city can only become truly “smart” when the citizens are involved in the process, and ready for it. Increasing citizen participation and gaining a qualitative insight about their needs and point of view, and effectively structuring the communication between the involved stakeholder groups, can help decision makers to work in a way that resonates with the population and not only solves the existing challenges but helps to prevent future risks. (Pereira et al. 2018)

City planners often develop personas of their perfect user target group or “smart citizen” and make assumptions that they are rather tech-savvy and willing to increase their interaction with city’s spaces and services digitally. Although this might appeal to a growing part of the population, there is a risk to exclude important segments of the overall population and increase digital gap, creating cities that are not balanced and may struggle in sustainable long-term development. For this reason, the smart city metrics used in assessing and comparing smart cities globally, are prioritizing each city’s context and often adding sub-dimensions and indicators to the earlier mentioned six. This helps to minimize the self-proclamations of being a smart city and enable a relative comparison between cities. As an interesting fact however, it is quite common that cities in the last positions of international rankings are excelling in one or several dimensions. (Al-Nasrawi, Adams & El-Zaart 2015)

2.1 Evolutionary Stages and Strategic Approaches

Clearly, every city develops over time and there are several paths to becoming more citizen-centric, smart and sustainable. There is rarely a complete, or universal recipe of what a government should do to make a city smart, as a city would typically need to align their strategy to the starting situation, key values, vision and urban challenges that require more focus. As mentioned earlier, with increased urbanization and the world population moving toward cities, have a strong influence on the local situation, and in a more interconnected world, urban planners can try to analyse their situation and compare and share their approach to challenges with other cities. (Berrone & Ricart 2018) Not only can smart city strategy be used to improve the infrastructure and social aspects, it provides countless business opportunities, and can lead to strengthen the economic development, based on new and innovative products and services. (Smart City Working Group 2013)

From the technological perspective, Diamandis and Kotler have identified Six Ds as a technological progression road map, which relates to the changing structure of organizations and technologies. If historically, disruption meant creating a new product or service, and improving the quality while lowering the costs, as a result of digitization it has become easier than ever to access tools that were only available to governments and large, impactful organizations. It's not necessary anymore, to hire thousands of workers or have large facilities, or to wait for decades until there are any successful results. Start-ups these days, are often very small and can create new products, generate a large social impact and revenue streams in a short time. Peter Diamandis sees this growth in six steps, namely the Six Ds of Exponentials: digitization, deception, disruption, demonetization, dematerialization, and democratization.

- **Digitalization** – digitalized technology makes exponential growth and doubling the price/performance within a short time period achievable.
- **Deceptive** – in the beginning it can take some while to get up to speed and technology can seem hype.
- **Disruption** – often unexpectedly, the technology is involved in disrupting established industries.
- **Dematerialization** – Things that were expensive 50 years ago and took a lot of space, can now be integrated in much smaller devices, like smartphones for example, have a camera, GPS, music player and many more functions. Further on, physical tools can be dematerialized into digital apps.
- **Demonetization** – As a consequence of the previous steps, technologies become cheaper up to a point where money is taken out of the equation. This, in turn can make earlier established business models disappear.
- **Democratization** – with technology becoming cheaper, it is available to more users and is democratized. (Ramirez 2017)

In many cases, cities choose to improve mobility as the first step towards a smart city. It's the so-called low hanging fruit, in the way that it's relatively easy to start with showing increased transportation with the help of data analytics, and the citizens are easily engaged. In Boston, for example, people can use their smartphones to track road defects and upload them to be seen by municipal authorities. This helps to detect road issues and improve the road network. It also proves that by collecting and analyzing the information about city, can effectively transform the way it is maintained. (Murray 2016) Improving the

public transportation, has shown to be one of the most powerful ways of showing the residents that the city's authorities are determined to improve the situation and the quality of life. (Simpson 2018)

In China, the term "smart city" is widely accepted and a rapid development of cities is very closely related to the cooperation between IT companies and the government. By 2013, there were already nearly 200 approved pilot projects for smart cities. Many of them, for example, Nanjing, Shenyang, Chengdu and Kunshan, are cooperating with IBM. In their approach of developing a smart city, it is divided into four layers, that are: sensor layer, network layer, platform layer and application layer. (Li 2015)

A different case of smart city development is Pune in India. There, a five-step approach was implemented in their city strategy. The five steps: Envision, Diagnose, Co-create, Refine and Share, were communicated with several city stakeholders and the city organised mini-labs for selected city representatives and citizens that aimed to improve existing solutions. There was also support from associations and citizens were engaged in campaigns and initiatives to share ideas that could later be discussed in the municipalities meetings and have an impact in the planning priorities and decisions. Pune is among the top 50 smart cities according to a research made in 2018. (Eden Strategy Institute & ONG&ONG Pte Ltd 2018)

One way of comparing cities, that is quite popular and attracts the public attention is city rankings. This can potentially attract investors, new businesses as well as tourists and residents to the city. Comparing the current smart city indicator frameworks, it can be seen that the three sustainability pillars from corporate development - people, planet and profit are widely adopted. (Airaksinen 2016) And yet, there are a lot of indicators, many of which are not standardized or consistent. While the dimensions differ from research to research, and it tends to change from year to year as the methods are being further developed with new variables, the selection of them won't be analysed in-depth in this research. But it's important to mention that each dimension includes several indicators that can be successfully analysed in a city. As an example, the IESE Cities in Motion in 2019 included nine dimensions - human capital, social cohesion, the economy, governance, the environment, mobility and transportation, urban planning, international outreach, and technology – as adjusted from ten dimensions in 2018. This further included 96 smaller indica-

tors (13 more than in the previous edition) which reflect on the contemporary situation, geographical analysis and altogether create as possibly good and comprehensive overview. The project and dimensions are not seen as static or standardised and therefore, future adjustments can be expected. IESE Cities in Motion 2019, is willing to promote changes at the local level and to develop innovative ideas and tools to take the opportunities and tackle the challenges globally. They have developed a “Cities in Motion Index” (CIMI) model based on four factors: sustainable ecosystem, creative activities, equality among citizens, and connected territory (Berrone & Ricart 2019)

While being ranked as a “top smart city” sounds appealing, for someone in the planning, it might be confusing to try making a strategy based on indicators that change nearly every year. Also, the research for creating the rankings is typically limited to a region or the cities are selected by specific pre-defined factors. This could make seem it hard for a less known city to be even considered for these rankings, but there is a more standardized way to evaluate a city’s performance. That is the ISO/TS 37151 Smart community infrastructures — Principles and requirements for performance metrics. It is based on the perspective of city residents, managers and the environment, and outlines 14 categories of basic community needs. Typical community infrastructures like energy, transportation, water, waste and ICT systems are included. The ISO standard document is publicly available and is mainly meant for community managers including mayors and other city officials, as well as infrastructure managers, development agencies and investors. It is reviewed at least every five years to stay current. (Lazarte 2015)

In a more simplified analysis, smart cities may generally develop on three dimensions – scope, scale and integration. (Eden Strategy Institute & ONG&ONG Pte Ltd 2018) The scope would mean focusing on one or several smart city fields of action, such as mobility, education, healthcare and more. The scale can be measured geographically, by the involvement of citizens or budget, for example. Integration means analyzing the data about the city and acting to make improvements.

Researchers as Boyd Cohen, state that the process towards becoming a smart city can be divided into four stages or generations, beginning with “Smart City 1.0” that is technology-driven by companies to “Smart City 4.0.” that is seen as a measurable ecosystem which will be enhanced by collective intelligence of its citizens and users (platform approach). (bee smart city 2019)

2.2 The Smart City Transformation Process

Although it might seem as a good idea to start building and designing from a fresh start, it is usually a lot more expensive than making improvements to the existing city situation. It has been proved that in mature cities, the application of smart technology can give more practical benefits and it is also more appealing to the citizens, instead of forcing them to adjust to a specific smart city vision. (Allam & Newman 2018) Many cities find it easier to test smart solutions in smaller ecosystems, before implementing them in larger geographic areas. Some examples include the Silicon Valley, Boston Waterfront Innovation District, Helsinki Kalasatama district and Singapore's Punggol Digital District. (Eden Strategy Institute & ONG&ONG Pte Ltd 2018)

A city can be viewed as a complex organization form, with large relational formations and diverse relationships. Although typically centric unities, cities are very socially constructed, dynamic and diverse networks that mature and advance progressively over time, and in fast-developing regions, traditional sectorial planning can no longer be applied. Instead, many cities are aiming for horizontal collaboration and responding to the existing and emerging interests of stakeholders, also considering nature and environmental constructs. (Andersen et al. 2009) The effectiveness of Collaborative governance can be seen, as it increases evidence-based decision making and promotes collective action. Besides the extensive use of ICT, cities are offering more options for mass collaboration, that in turn leads to transformation in governance models. In an interdisciplinary environment, where context-specific solutions are needed, this means that rather flexible institutional arrangements are often required. (Pereira et al. 2018)

It has been recognized by several researchers, that the three primary issues which could be addressed and potentially solved with the help of smart technologies are:

- **Culture:** especially the ways of making meaningful associations with the city's people and places, as well as history.
- **Metabolism:** as excessive resource consumption and waste production are important to optimize in cities.

- **Governance:** involving the new partnerships on local and regional levels between the stakeholders and make it possible to implement urban solutions effectively. (Allam & Newman 2018)

2.2.1 Action field 1: Status quo analysis of the smart city ecosystem

The first step to giving a good diagnosis is to analyze the status of the key dimensions on a general level, realizing that in most cities these dimensions are developed in different levels and the environment varies greatly among them. In most of the smart city rankings, the overall result is the combination of these factors and even the top cities have less developed fields of action, while cities from lower positions might excel in some of the dimensions. (Berrone & Ricart 2018)

A result of the status quo analysis will tell, in what evolutionary phase the city is:

- **Smart Cities 1.0:** with a technology-centric vision
- **Smart Cities 2.0:** with a government-led vision
- **Smart Cities 3.0:** a citizen- or human-centric vision

(see smart city 2019)

Paradoxically, there may be a realization similar to the one of Maciej Markowski: “It’s ridiculous that it’s easier to order from a restaurant across town than it is from the in-house restaurant or easier to find someone on LinkedIn than it is to find someone in the building, or that’s it’s easier to complain about an Amazon delivery than it is about a printer that doesn’t work.” (Wilding 2019) This refers to the urban context where there is a gap between the city’s groups – social settings and companies, that have not yet adjusted to the modern coexistence with adopting digital tools in a large variety of environments. Factors like immigration, health system, public safety and others, are developed at different speed and it’s essential to manage the ways how society, companies and the government share a common vision and enable social cohesion. (Berrone & Ricart 2018)

An important factor that many cities start with is economy, where factors like GDP (gross domestic product) are considered the most important measures of performance. However, in the smart city perspective, it is not as exclusive and is one of the indicators among city’s sustainability and governance effectiveness, as well as many others. In each individual

city environment, it is recommended to go beyond the main indicators in the process, and analyse the sub-categories as well, to better understand the reasons and city-unique situations. It is, certainly worth the time to look at the publicly available and comparative factors like the E-Government Development Index (EGDI), which in relation to the technological development, may further reflect how the city succeeds in providing online services, connectivity and human capacity in this context. Among other factors, the environment is closely related to sustainability and goes further than the local ecosystems – as it is very much influenced by the region. Some of the respective analysis parts, can include the support for alternative energy sources, natural resource management and the existence of relevant policies.

It would be recommended to involve the people from respective fields, when analysing the city dimensions, to gain a good overview and already in this phase, collaborative efforts can make the process more efficient and qualitative.

2.2.2 Action field 2: Analysis of needs and optimization potential

The analysis of needs and optimization potential after learning about the existing situation in the city, is the next strategic step towards a smart city, before selecting and implementing the optimal solutions. As one of the main points, a smart city surely needs to integrate technologies and systems to create an organic multi-sectorial network, that is agile and offers open access for future developments. In this sense, ICT is used to create a new type of environment and platform for communication, offering the collaboration in virtual spaces. There have been extensive discussions about strong corporate-based approaches from leading companies, that may pose risks for the city independence (Smart City Working Group 2013), as well as about the level of data monitoring that requires citizens to really trust in government. As an example, the privacy levels in Singapore may cause problems and be unacceptable in many other cities. (Simpson 2018)

The amount of diverse data sources in most cities is still extensive and involves many private companies as well. While there is a growing need to consolidate the data and adopt data standards on a global level, cities are generally willing to integrate different sources in a holistic system that could be interrelated to its different subsystems. (Smart City Working Group 2013) As the relationship between cities and businesses, as well as their

users – citizens and visitors is changing and being influenced by many factors including technology - often people expect the same real-time efficiency and accessibility of goods and services with their local government, as it is possible with online services and social media. This puts cities under pressure to be as digitally responsive and active as other entities. (Murray S., 2016) Also, maintaining the international recognition and city brand, it's needed to regularly evaluate the strategies for attracting tourists, foreign investment and adjust the style of communication on a variety of levels. (Berrone & Ricart 2018)

A rather interesting case example is the city of Santa Maria Tonantzintla in Puebla that was about to become one of the Mexico's first smart cities. However, this was not received positively as the residents felt that their local traditions are not preserved in the new plans. There were severe misunderstandings about how the smart city vision would be implemented, as, what citizens saw as "remodelling" meant repairing the old pavement where it's needed, the actual projects included replacing the characteristic cobblestones with stone tiles, as well as removing some of the city's beloved landmarks like the clock tower. Although the objectives were to benefit citizens with things like safe crosswalks, free internet, trash cans, ecological benches and video surveillance, it was perceived as westernisation and a form of cultural racism (malinchismo: a feeling that the foreign, particularly western, is always preferable to tradition), seemingly favouring the visitors more than residents. It turned out that the majority of citizens weren't actually aware about the smart city project, as in the consultation meeting organised by the municipality, under 20 people arrived, which is not a representative sample and, after repeated protests, the project was cancelled. (Wattenbarger 2018) Although this is just one case, it emphasizes the need to properly analyse the needs before executing a smart city strategy and communicate the key things with all levels of society.

The trend of implementing new technologies and replacing the old ones isn't going away though, and it is expected that after companies, the governments will be the second largest adopters of IoT ecosystems. Focused on productivity, lower costs for public services and improved citizen experiences, operational intelligence is required. Defined as a form of (business) analytics, it provides real time insight in the operations, through connected digital systems and sensors in the environment. It's used to prevent accidents, improve efficiency and make predictive suggestions. In the city frame of reference, often IoT is a good option to invest in small solutions that are effective and bring fast results.

Still, there are many barriers towards the implementation of new technologies and main ones are:

- Silos
- Legacy systems
- Depleted economies
- Lack of know-how
- Data Ownership
- Citizen Expectations
- Small budgets

They can be overcome by relatively simple steps, that can be systematically made to improve the situation.

Silos: Setting up specific smart city teams with own leaders, is common to enable better cross-department communication.

Legacy systems: Cities existing legacy systems have the potential to be integrated in the construction of citywide IoT solutions.

Depleted economies: Most IoT solutions, if implemented well, can improve the city's economy and indirectly help dealing with related problems.

Lack of know-how: Municipalities should work on obtaining a high level in-house expertise through training or hiring new staff members, or invest in external guidance.

Data ownership: there are alternative ways for cities to access data owned by private companies through partnerships as public-private-people partnerships (PPPPs) and capitalizing city's own data sets is an option as well.

Citizens' expectations: Proof of concept projects and testing out solutions in real life situations (sometimes called living labs) can help with managing the expectations, as well as promotion with highlighted benefits.

Small budgets: Offering a proof of concept, outcome-based contracts with solution providers, as well as alternative forms of funding with government grants, revenues from advertising or different kinds of partnerships. (Vilajosana 2018)

Several research projects in the EU and other high level organizations, have been investigating the sustainable management possibilities in applying innovative solutions, mitigation strategies, risk management models, disaster prevention, ICT tools and guidelines, as

well as delivering comparative analyses. New methodologies and protocols are being collectively developed and made freely available, and these – aiming to enrich the understanding of present risks by adding an historical perspective allow to effectively integrate the knowledge in smart city strategies. (European Commission 2018)

2.2.3 Action field 3: Selection and implementation of smart city solutions

Agreeing with Berrone & Ricart “In order to execute the strategic plans, it is necessary to acknowledge that cities cannot do it all alone. The transformation of a city is not an individual undertaking but instead a collective endeavour, so collaboration is essential.” (2018) Implementing innovative and high-quality solutions in the city that, for example, improve the public transport solutions, respond to the economic and labour needs, that lead to city’s further development and growth. Since cities play a main role in social and economic aspects worldwide, and have a huge impact on the environment (Albino, Berardi & Dangelico 2015)

It has been observed by some researchers, that cities are becoming more of a problem than a solution, by increased consumption of water, energy, and other resources, leading to irreversible environmental damage. Thus, a better understanding of the energy and materials flow is required and in smart city projects especially. ICT solutions are one of the most popular approaches towards maintaining a positive impact on the environment, together with economic growth and increased life quality. (Allam & Newman 2018) Infrastructure is inherently interdependent and there are influences of this, in the whole city’s environment, including factors as mobility, health and others. (Harris, Shealy & Klotz 2017) The multidisciplinary challenges need to be addressed from theoretical and practical levels, as each of the city dimensions has their own key stakeholders and resilience-building processes. Here, participatory processes are needed in the innovation and in major developed cities, this is already a common practice. (Marana, Labaka & Sarriegi 2018)

Achieving “smartness” is more than a goal, but rather a continuous process that can be applied to cities of different sizes and situations. As a city grows, “smart” solutions could help with the scaling and growing complexity, while in the smaller cities projects that require less investments, can improve the infrastructure through tangible return on investments. The established infrastructure can further be used to implement new services and develop towards the next phases. (Grizhnevich 2018) It is also noteworthy that there is a

difference between “getting it first and getting it right” and this maxim applies just as well to technology, innovation, and city development. (Simon 2011)

When key stakeholders are engaged from the early phases of projects, a focus shift can often be observed – from cost minimization to optimizing the infrastructure design. By applying systems thinking, the perspective shifts respectively, from the parts to the whole, from objects to relationships etc. that are necessary for creating more sustainable outcomes in the social, economic and environmental fields. According to leading industries, a holistic approach enriches the design process, and the three key steps of the design process that can also be applied in a smart city are:

- Establish common goals—then align incentives
- Practice mutual learning
- Share information with everyone

And three simple design methods that can be applied:

- Define the scope to align with vision and desired outcomes
- Design on a clean sheet
- Start design analysis at the end-use and work upstream

(Harris, Shealy & Klotz 2017)

With a good design framework, cross-disciplinary collaboration is necessary in nearly all smart city projects, to solve the variety of problems. As will be described in the further chapters of this research, most of the smart city projects are based on the collaboration framework of triple or quadruple helix, consisting of local governments, academia, industry and society. The complexity of the projects indicates many interdependencies and a need to align the stakeholder interests and expertise.

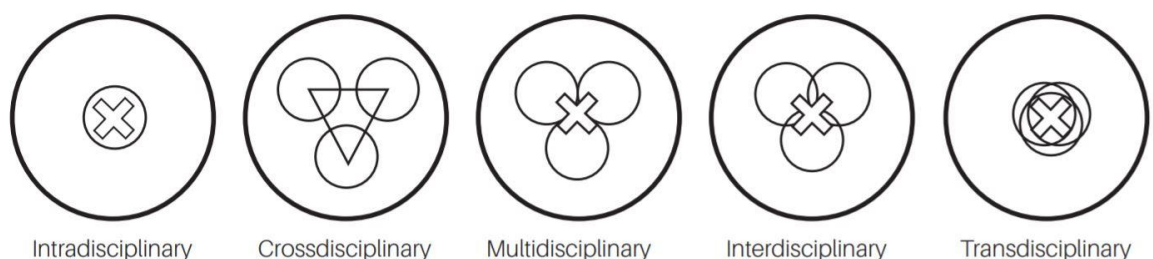


Figure 1. Depiction of different forms of collaboration across disciplines. (Borsboom-van Beurden, et al. 2017)

In the figure above is a visualisation of the different levels of integration of disciplines, where X represents the problem and the circle - the disciplines. Each larger circle represents the levels of integration as follows:

- **Intra-disciplinary:** confined to a single discipline
- **Cross-disciplinary:** interpretation of one discipline from the paradigm of another
- **Multidisciplinary:** cooperating, while using knowledge from their own discipline
- **Interdisciplinary:** integrating the knowledge and approaches of different disciplines
- **Transdisciplinary:** unifying frameworks and knowledge beyond disciplinary perspectives

(Borsboom-van Beurden, et al. 2017)

With a design framework and adjusted collaboration levels, smart cities still face obstacles in creating services to control and monitor the projects and provide a productive environment for interaction. There are four service categories that can be, and are often integrated in the development.

- **Decision support systems:**

Also known as the “city dashboard”, this lets city planners (or citizens) to access and control the data flows and analyse the key measurements, as well as be informed about exceptional circumstances.

- **Urban behaviour modelling:**

Modelling uses patterns that let city planners and managers to explore different scenarios and create suitable systems for reacting and adjusting the resources properly.

- **Urban optimisation:**

Allows to plan and optimise the systems of applications, especially in the fields like mobility and energy management.

- **Personalisation and recommendation:**

Incorporates adaptive intelligence and makes it easy to clarify the user preferences in a large audience, as to help improving services and delivering better experiences to citizens. (Smart City Working Group 2013)

3 Defining Platform Business

The most powerful platforms globally are based on intelligent digital technologies and their intelligent usage. Differing from the traditional platforms, they are not defined in relation to physical assets, land or natural resources. In this thesis, the word “platform” is used to mainly describe collective intelligence systems (CIS), that include social networks and content sharing platforms, and have a significant impact on knowledge creation and sharing. They can be operating at a societal level or for example, at organizational or corporate level, facilitating the communication between individuals, teams or organizations. The main stakeholders of CISs include architects who design and describe the systems, the owners who define their goals and purpose, the managers, developers, analysts and of course, the actors who can access and contribute to the platform. The term “user” can be used to refer to all the stakeholders who interact with the platform. (Musil et al. 2015)

It's a common mistake to think that a company's platform equals their business. Although the concepts are related, platforms are used to support and extend the companies. As an example, some researchers state that compared to platforms like Facebook, Twitter or YouTube, the popular Quora online site where users can ask and respond to questions and share their opinions – should be regarded as more of a website and community than platform. Even though it contains content contributions from the users, it is rather a collection of pages and a relatively static website, than a vibrant platform where applications can be used. This difference between platforms and websites has been a relatively recent discussion topic in the digital industry and is closely linked to the rapid technological development. It is expected that within the next decade, the web will reach a phase where it is semantic and machine-readable. This will include metadata (data about data) as a fundamental part, and in the industry, this is known as the third development phase of world wide web, namely “Web 3.0”. (Simon 2011) Although this research won't discuss much further about the already cited technological aspects, it's important to also distinguish between the web and internet even though they are often used interchangeably. Internet, as “network of networks” or the infrastructure, that uses a set of rules (Internet Protocols) letting different networks communicate. The web (world wide web) is the system and collection of web sites that can be accessed with a web browser and are typically using the http protocol to transfer data files and communicate in the internet. (Horvath 2006)

Clearly, using the web to just browse news and exchange e-mails, is in the past and businesses, and individuals can access an enormous amount of resources, collaborate on projects globally, and in a growing number of cases, do a major part of their work online, from nearly anywhere. It also doesn't require a lot of resources or experience to create blogs, podcasts, videos and own websites, meaning that the speed of technology adoption and creation of new collaborative tools and frameworks is only increasing. It can be argued that the international business "playing field" has been levelled and it's much easier now than in the past, to enter the market and become successful. However, the competition and customer expectations are also growing. Platforms will often win when they offer a "one-stop shop" even if all the features aren't top quality. Even though each customer might have an own idea of what makes their user experience cleaner or better, the majority likes to have one platform instead of 100 different sites and services on different devices. (Simon 2011)

Strong platforms are often recognized through verb branding, defined as "a state in which many people use a company's name as a verb." These days it can be considered as an achievement, although earlier it wasn't viewed as positively. For example, in 2006, the Oxford English Dictionary formally recognized Google as a verb, even though at the time, Google didn't even advertise. (Simon 2011) For Google, this turned out to be a major success. A similar case some years earlier happened to Xerox company, as it became so popular that people started to "xerox" when they actually wanted to photocopy something. The company then ran a campaign with publishers for several years, asking them not to use their brand name as a verb. (Peterson 2017). Companies like Post-It or FedEx, Uber and Airbnb have their own stories about verb branding as well. The main reason for contrasting views on this, is that while from marketing perspective it's great to make the brand name known, from the legal and trademark perspective, there are concerns about 'genericide' as a brand may lose trademark significance – as well as emotional significance to customers that differentiates it from competition. (Woden 2018) Not only the platforms have potential to become household names through verb branding, they also change the way people use and access many services, at their core enabling better consumer satisfaction and communications. In cities, platforms allow businesses to create new services and use resources more efficiently, such as by applying sharing economy principles. (Wray 2018)

With the accessibility of internet and new devices, such as smartphones and tablets that are replacing laptops and desktop computers, there is less distinction between the “at home” and “at work” just as it is with the “consumer” and for “business”. Companies like Google, Facebook, YouTube, Apple and many more are offering more than consumer products and services, and despite their large size, have been able to stay agile. One of the most powerful components of this, is the online community that helps to increase the amount of visitors, as well as convert them to leads and loyal customers. Another important thing is crosspollination – embracing third-party collaboration and in many cases, even being present on competing sites. As an example, Google has an active Facebook page, Twitter account, as well as several product pages. Also, Facebook has an official YouTube channel. This applies to hardware as well, because companies like Facebook (and many more) have their apps available for both Apple and Android devices, and as a following example, Apple has developed apps to support the fans of Kindle, to allow them read their favourite books on iPads and iPhones. What that makes platforms extremely valuable, is the ability to scale and incorporate new features in a quick and easy way, as well as add and engage with new users, customers, vendors partners and more. (Simon 2011) There are some challenges as well, and especially in recent years, web-based companies have struggled with becoming profitable and standing out from competition, and there are some concerns about related topics such as data ownership, transparency and social responsibility. (Wray 2018)

3.1 Anatomy of Platform Business

Platforms like Google make the life of many people easier, making it possible for them to communicate efficiently with e-mails, listen to music, conduct research, make purchases, design web pages, presentations and spreadsheets, as well as many other things. Anyone with access to internet can choose to use the diverse platform services, and benefit from them – in many cases, completely for free and from their own preferred device. This hasn't always been the case though. In the figure below, it can be seen how things like the target market, ecosystems, collaboration and others have changed, with the rise of platforms. A more agile and open creative approach, as well as faster speed of development and decentralized collaboration have been enabled. (Simon 2011)

Attributes	Pre-Platform Age	Platform Age
<i>Target Market</i>	Predominantly business-oriented. Planks used in an office by employees on a single device (PC).	Both business- and consumer-oriented. Planks used everywhere by everyone on multiple devices.
<i>Ecosystems</i>	Stable. Primarily comprising relatively few arms-length resellers and strategic partners.	Vibrant, robust, dynamic. Comprising individual developers and small partners. Partnerships and communities quickly form, change, and dissolve.
<i>Collaboration</i>	"We'll buy you or we'll crush you." Fixed pie. Competition-based.	"We want to work with you." Grow the pie together. Cooperation-based.
<i>Technology</i>	Mostly closed source or proprietary, sometimes available via expensive licensing.	Mostly open source and less proprietary. Often takes form of a free development kit or an API.
<i>Innovation</i>	Top down. Internal or via acquisition. Usually slow.	Bottom up. External or partner-based or -assisted. Much faster.
<i>Marketing</i>	Centralized single company campaigns, rigidly coordinated and controlled.	Comarketing and partner-driven campaigns. More independent, organic, and decentralized.

Table 1. The age of the platform. (Simon 2011)

Practically, the majority of people access internet with either Apple or Android software, on a device that is produced by another company, and the apps are typically developed by third-party developers. The platform age – approach is especially important when talking about companies like Airbnb or Uber, where the value proposition and user experience is co-created with the hosts / drivers, in the respective case. The participants of the platform make the platform what it is and define whether it will be successful or not. This has been a major turning point in marketing activities, as, the platform users – both service providers and customers, are also able to create influential marketing messages. This creates a large potential for various types of bloggers, influencers and brand ambassadors. Companies (app providers) like WhatsApp, Snapchat, TikTok and Instagram, have applied this by asking users to import their phone contacts, or invite friends to the app, relying on the app store ratings and community viral loops, where each new user invites more users, instead of using traditional advertising practices. (Claire & Reillier 2017)

Although platforms can be extremely effective in driving innovation and collaboration, being the first one to the market can actually be a disadvantage. To elaborate, there is a marketing concept known as first-mover advantage (FMA), meaning that the first significant provider for a specific market, has a competitive advantage to gain customers and control resources. This might work with more traditional markets, however, in the digital marketplace, it's common that companies are more successful by applying "copycat" strategies. As the innovation itself requires experimenting and therefore, involves making mistakes, the companies that choose to follow in the path paved by others, can observe and learn to create better processes and business models. In practice, the larger and more established companies are the ones observing the small and medium sized ones, as well as start-ups, that might be first to reach the market. Larger companies can then bring the tested and improved product to the mass market. (Simon 2011) As a matter of fact, the earlier mentioned WhatsApp and Instagram are currently owned by Facebook as a corporate parent company. (Gilbert 2019)

The products, services and even communities on a platform are called "planks". By adopting third-party collaboration and new partnerships, larger companies are often trying to reinvent themselves and create new ecosystems by building their own platforms and integrating planks. This platform business model can be seen as a circular process in the figure below, where each step helps the company grow and develop further.

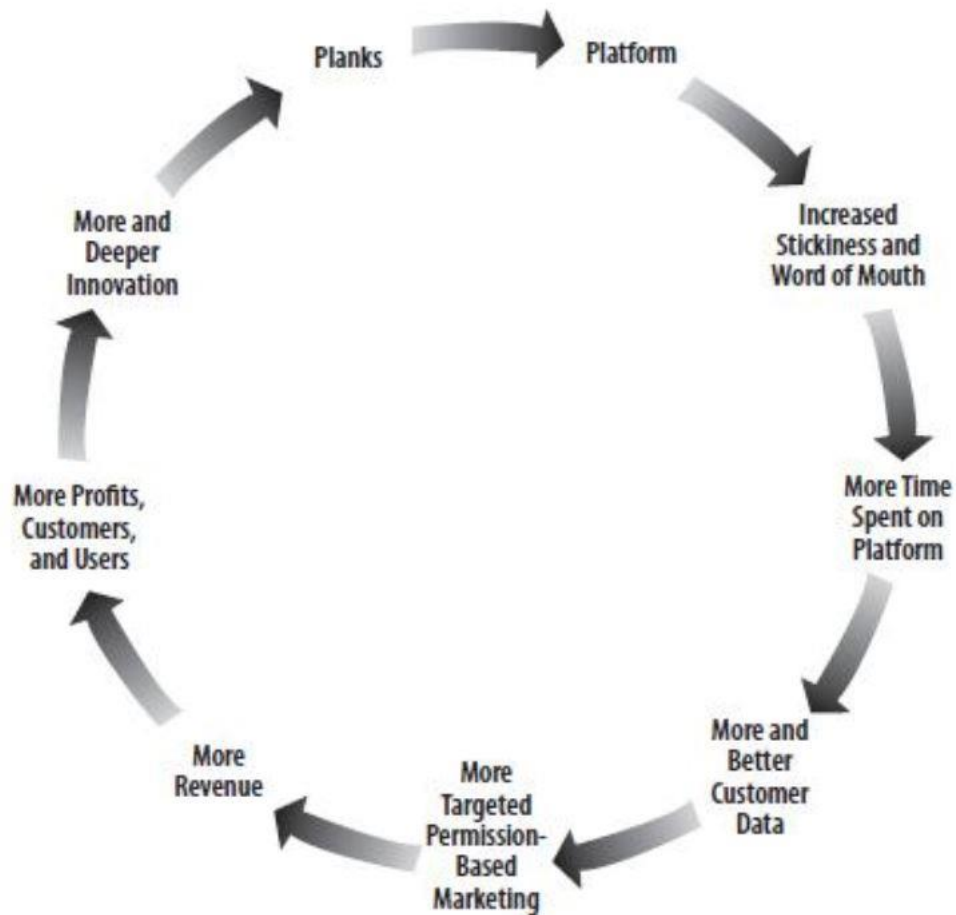


Figure 2. The Platform as a Business Model. (Simon 2011)

Taking the example of Facebook, it has become a part of the daily life for millions of people, providing them mostly free and useful services. Facebook encourages user interaction and participation, as well as creative experimentation and development. It's easy to create visual and feature-rich micro-sites and interest groups with provided templates. Users can see the latest activities of their friends, social groups and companies or celebrities they like. It's possible to stop following those that are no longer interesting or stop seeing them for a time period – making a balance between the personalized and standardized parts of the platform. Another useful feature is the ability to share different types of content – text, photos, video, status updates of their work, relationships, education, wellness, traveling and much more. Importantly, the interaction is encouraged not only by likes, shares and comments, but also tags that can rank from friends, to celebrities, causes, groups and more. With users spending a lot of time on the platform, companies are also interested to have a strong presence, and are more likely to buy advertisements and engage. Other valuable planks in the Facebook platform include events, games, messages, groups, that

increase the Facebook's stickiness factor. In 2010 it was reported that millions of people spend one third of their time online on social networks and games. This results in many hours of enjoyment, or wasted time, depending on the perspective. There are often updates, to make the user experience better and tools to help users be more effective in managing their time on the social networks, like muting the notifications. (Simon 2011)

From the smart city perspective, the European Commission has characterized platforms as facilitating the effectiveness of collaborative multi-stakeholder innovation networks – also calling them “innovation” or “participation” platforms, where users have a common vision. This means, platforms can bring together the public and private sector, research, industry, regulatory authorities, policy makers and others. Typically, the scale is limited to the local municipality, where the key city actors can then engage and work together. (Ojasalo & Tähtinen 2016) However, it's important to note here that platforms should optimally be neutral intermediaries since they have the power to set prices, decide about who can participate, collect data, create the matchmaking rules, and make many other design choices that determine the platform culture. (Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017)

When working with open and collaborative innovation, as will be explained in the further chapters, the innovation platforms in cities don't necessarily need to be in a pre-defined virtual or physical space but can take place on a technological platform (or virtual network) and function as a way to organize strategic approaches and systematically facilitate innovation and market processes by attracting and engaging with users. (Ojasalo J., Tähtinen L. 2016) Specific smart city platforms can be created around energy, utilities, mobility etc., and there are companies providing network infrastructure and product or technology specific solutions – such as cloud technology by IBM or Microsoft, AI surveillance by NVIDIA or smart lighting by Philips. However, there is no single “platform of platforms” in the smart city environment that would have features for all the smart city action fields or connect the existing platforms. (SmartCitiesWorld, 2018)

3.2 Types of Platforms

It's important to determine what kind of platforms are beneficial for businesses, academia, consumers and industries, and how they can facilitate the stakeholder engagement in a city. Platforms can be rather complex and diverse, but they typically involve:

- information about providers and available goods and services;
- information about consumers;
- information about accepted transaction mechanisms;
- trust-building and self-regulating mechanisms.

(Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017)

It can be tempting to stick with traditional practices and systems that have worked earlier, but it's critical to explore new ones and understand what exactly is beneficial to the existing situation and, in the context of smart cities, helps to develop in a sustainable and smart way. (Simon 2011) Seeing the city management as authorized by the people it consists of, and that create the major stakeholder groups, it's clear that success, means solving their fundamental problems. (Turner 2017) Quite a diverse group of platform companies - Amazon, Apple, Facebook, Google, are known as the "Gang of Four", stating that these are the four companies currently ruling the global technology landscape. Each of these has entered new markets and created new ones, by moving from its core business model and expanding in multiple directions. These platforms are known to embrace experimentation and change, and according to researchers, have collectively made the platform business model as the most important one in the 21st century. (Simon 2011)

In this research, the author has acknowledged existing research about sharing economy platforms - SEPs that have been described and categorized by authorities as the European Commission and Organisation for Economic Co-operation and Development (OECD), as well as several researchers. In accordance to the platform definition and functionality as described in the previous chapters, SEPs are digital platforms and social network communities that facilitate and mediate sharing between their members. They act as intermediaries between peers - providers and consumers and enable a range of valuable interactions. (Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017)

SEPs can be classified by different criteria and typically are either **digital marketplaces**, or **open communities** and operate in a **for-profit or non-profit** manner. Further on, they

may be access to **physical assets** such as housing or transportation, or **intangible assets** such as knowledge. Regarding the intermediary and matchmaking mechanisms, the algorithms for this make platforms highly scalable. The two key distinguished platform types here are - **centralized and decentralized markets**. As an example, Uber is a centralized marketplace, where all orders are related to one central type of exchange. Airbnb, in contrast, is a decentralized marketplace, where there are different providers of products and services, that can be competing against each other. In the latter case, the challenge is to create an effective search process for matchmaking between peers, and let users refine it in the process.

The platforms that are non-monetary may rely on sponsors and investment money, while the ones that operate for-profit, have to consider monetization in their business model and decide on transaction costs, matchmaking fees, membership, service fees for things like insurance or merchant commissions, advertising fees, possible fines, vouchers and more. Another important point is the platform culture, which defines the relationships on the platform, as well as externally. This can be classified in three categories as:

- **Peer friendliness:** regarding the relationships towards platform users as supportive and friendly, or hierarchical and non-personal;
- **Regulation friendliness:** as the platform may be communicating with regulatory authorities or trying to resist some regulations;
- **Cooperation with other platforms:** depending on if and how the platform is engaging with similar platforms, including competitors.

(Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017)

Specific to the smart cities and sharing economy platforms, in the 2018 Sharing Cities Summit in Barcelona, the Declaration of Sharing Cities was introduced and signed by nearly 50 cities. It is an international collaboration between cities, that integrates several principles for dealing with threats and opportunities in the platform economy. As platforms have an undeniably increasing impact on the economic development and life quality in cities, it's essential to provide a collaborative atmosphere where individuals and communities can benefit from each other and productively interact. (Sharing Cities Action 2018) Collaborative innovation in cities addresses improvement of everyday life conditions, implementation of new technologies, economic opportunities, and promoted sustainable and holistic development. (Ojasalo & Tähtinen 2016)

Below is a shortened description of the ten principles that have been incorporated in the Declaration of Sharing Cities.

1. To distinguish between the different models of digital platforms, in order to design public policies accordingly. Distinguish specifically the platforms and activity that are not built on truly collaborative models, from those that are collaborative and favour participative governance.
2. Empower people to have opportunities to earn or increase their income without contributing to social precariousness or constituting an administrative burden.
3. Ensure fair, legally compliant and timely compensation. Provide fair working conditions and access to benefits and rights for workers.
4. Prevent discrimination and biases by supporting fair and equal access to work for people of all incomes, genders and backgrounds.
5. Ensure health, safety and security standards along with effective institutional mechanisms in order to protect them.
6. Promote sustainable practices less oriented on the marketization and commodification of goods. To apply the framework of a circular economy, reduce emissions and waste and promote efficient use of resources.
7. Protect citizens' digital rights through the implementation of policies and ethical digital standards (e.g. the rights of privacy, security, giving citizens a choice about what happens to their digital identity, who uses their data online, and for which purposes).
8. Guarantee respect for the legal jurisdictions of cities, ensuring transparency in operations and transactions in relation to data transfer from the platform. Promote digital protocols in order to guarantee compliance with the regulations of each city. Share inspection instruments, mechanisms and techniques between cities. Require platforms to ask for permission before operating in a city.
9. Promote the development of local collaborative economic ecosystems and particularly small and medium enterprises (SMEs), based on positive impact in cities.
10. Preserve the Right to the City and Urban Commons, strengthen communities, to protect general interest, public space, and basic human rights, such as access to affordable and adequate housing.

The cities that have already signed The Declaration of Sharing Cities include: Amsterdam, Athens, Atlanta, Barcelona, Bethlehem, Bologna, Bordeaux, Buenos Aires, Gothenburg,

Grenoble, Kobe, Corunna, Lisbon, Madrid, Milan, Montreal, Montreuil, Muscat, New York, Paris, Reykjavik, San Francisco, Santiago de Compostela, Sao Paulo, Seoul, Taipei, Turin, Toronto, Umea, Valencia, Vienna and Vitoria-Gasteiz. Other cities in the process of validation of the Declaration are: The Hague, Bristol, Eindhoven, Malmö, Praga, Rijswijk, Ghent, Melbourne, Singapore and Stockholm. (Sharing Cities Action, 2018)

4 Open and Collaborative Innovation

As a study done in 2018 about the top 50 smart cities globally shows, only 34% of the involved cities engaged the citizens in the co-creation of their development plans, while the engagement rate was 50% among the top ten cities. The engagement included public meetings, working groups with private and public entities, as well as other approaches for specific target groups. Nearly a half of the top 50 cities were using some form of open data, across a wide range of applications. (Eden Strategy Institute and ONG&ONG 2018) What this shows is, that the citizen expertise and local knowledge is crucial for city planners to create solutions and has the potential to significantly improve city's planning. When cities share data and are embracing collective intelligence, the decision-making is better. While connected and smart technological devices, quite literally can help the city's trains run on time, the technology can also be effectively used for collaboration. Even though it doesn't mean that a smart city would have a much more intelligent community than a traditional one, the decisions are typically better. (Guszcza & Greene 2017)

To elaborate on the concept of openness in this context – it is characterized by a lack of centralized control, over the related processes and potential results. The participants that are involved in open innovation, typically share the results of their work to be used by other participants, and in a way, this can be perceived as loss. It's important to consider the social, ethical and organizational benefits of the innovation and this engagement form, to go beyond the practice-based values. The leakage of knowledge can be seen as positive or negative, though, in an innovating organization, the positive knowledge leakage that benefits all the stakeholders, is often considered to be one of the goals. Defining innovation as the use of a new idea or method (Cambridge Dictionary 2019) and it can be fur-

ther described as “the process of making changes to something established by introducing something new that adds value.” (von Hippel 2010) According to this, there are unlimited possibilities to improve, and innovation is a continuous process.

In the previous century, Schumpeter (1934) had developed a well-known innovation theory, known as the “producer’s model” where the most important designs would come from producers that would then deliver them to the consumers as goods and services. It has been very effective model at the time, when factors like the scarcity of technological resources, expensive and time-consuming communication, or lack of flexible design methodology. It was cheaper and more efficient to standardize the production and perform it in a centralized way. Currently, it is possible for individual designers to access powerful personal devices, communicate globally with low to no-cost services, and use standardized design languages for collaboration. While, undeniably the producer’s model is still applied and many public policies are based on related views, it’s important to note that an “innovation gap” exists in most of the developed economies. (Baldwin, von Hippel 2010)

In a city, the administration is often burdened by silos, with people being uninformed about the bigger picture and not being able to communicate important information amongst themselves. When talking about possibilities, however, there is no lack of excitement and there has been a growing interest in creating more learning opportunities and increase the overall transparency in governance. (Berrone P., Ricart J.E., 2018) In some cultures though, it can be challenging to approach the open innovation mindset. Quoting Peter Drucker, “Culture eats strategy for breakfast” and as discovered already in the earlier chapters, smart city goes beyond launching new technology solutions and automation. Naturally, the collective intelligence and collaboration mechanisms are not something that can be perfected in one day, and there are typically several phases to go through. As an example, correlating with the development of technologies in the late 20th century, there has been rising interest in e-democracy and e-participation, which have led to the concept of open governance and innovative approaches. (Simpson 2018)

Closed innovation, being supportive for long term maintenance of specific positions, doesn’t allow as efficiently, to tap into the knowledge of all the relevant stakeholders and therefore, their contributions may be limited. With open innovation, the organization may not be in charge of all the choices, but in the same time, it can discover (or co-create) new opportunities that otherwise wouldn’t be possible. (Gould 2012) In 2010, New York City

was creating a citywide sustainability plan (PlaNYC 2030) and created an open survey with the question: “What do you think is a better idea for creating a greener, greater New York City?” Initially, it included 25 possible answers, but within four months of collecting ideas and creating a ranking, there were 464 new ideas and of the “top 10” ideas that were scoring to be potentially implemented, only two were from the originally provided ideas. This proved to be a successful case of open collaborative innovation, where, by sharing information about the project, community members were empowered and participated in a productive way. (Eggers, Guszczka & Greene 2017)

Increasingly, cities are making their data publicly available, and allowing the public to openly source some of the data. As a result of this, both professionals and amateurs can access the data and gain insights, as well as deliver innovation. This helps the city to become smarter and more citizen-centric by design, but also, with the availability of data and analysis, it becomes possible to create a better choice architecture and “nudge” the behavior of the citizens. According to several behavioral economy scientists, there can be effective predictive models and tools to promote a desired behavior change in a community. (Eggers, Guszczka & Greene 2017)

In an ideal case, all the information is shared with all the stakeholders. If their involvement is fragmented, as in a design-bid-build procurement arrangement, the innovation is slow and technologies are adopted in a less effective way. Although some microeconomic researches suggest that another reason is the perceived higher cost of the new solutions, there is also proof that the decision-makers are influenced by social heuristics and don't necessarily consider the costs as a critical factor. Instead, a combination of fear of changing the status quo, and losing reputation or status in the governance relationships, make the conventional, already established practices more appealing. It's important to incorporate consensus, reflexivity and reputation in the process of innovation, as it's common to rely on heuristic approach in many industries. As an example, designers with good established reputation that propose a new design practice, are more likely to influence the decision and make a change, than the ones who are less known or have a damaged reputation in the eyes of other stakeholders. (Harris, Shealy & Klotz 2017) As the majority of people are involved in several social networks such as work, school, neighbourhood, interest-based groups and more their roles and contributions to each one of these are different and highly context-specific, with the roles changing along with the circumstances. (Gorbis M. 2013) This is why, apart from the reputation, other cognitive and behavioural

biases need to be considered as well. Successful open innovation can be rather challenging, when done in a large scale and some of the main problems are rooted in the design of the innovation platform itself. Things that need to be considered, include the ways information is exchanged and presented, search strategies, and combination of ideas that are shared. Also, this is where neutral intermediary practices have to be well-performed. Open innovation intermediary platform is a multi-agent environment with self-interested members. (Bakici, Almirall & Wareham 2012)

Monetary incentives, although often the choice of reward for various kinds of contribution, are not always the most appropriate incentive type for innovation. It has been proven by many researches that extrinsic, direct incentives like monetary ones, lower the level of creativity and result in generally lower quality of work. It can be effective in algorithmic, simple tasks, but not in heuristic, creative ones. As example for successful large-scale collaboration with creative outputs and without monetary incentives, are Wikipedia, YouTube, open source software and similar projects. It has been observed that open collaborative platforms are successful in using more intrinsic motivators, and non-collaborative ones – with extrinsic motivators for participation. (Bakici, Almirall & Wareham 2012) Acknowledging the alternatives to money exchange, there is a history of documented “gift economies” and bartering. Although it has been considered by some economists to be relatively inefficient from the market perspective, it has been appreciated by social scientists. As people are the ones establishing the value of money as a social agreement, it can be observed that historically, groups of any size (including but not limited to communities, corporations, governments) can create their own currencies. It can also occur in a virtual environment where a certain commodity is used as a currency, such as points in an online game or community forum. Recently, the concept of cryptocurrencies has become a global topic of discussions and led to making the exchange of virtual currencies illegal in several countries, as well as a continuous development of regulations. (Gorbis 2013)

As mentioned, motivation is key and intrinsic motivation is more suitable for innovative environments, it is known that there are “economic” and “social” modes, where in the first one, people are motivated to exchange goods or services for equally valuable ones, and in the latter one it is done because of social expectations and intrinsic rewards. Motivating individual contributions in an organizational, local or global level, and deal with increasingly complex challenges, where the ability of one individual user-stakeholder to make a

good decision on their own is diminished, is a major task for the platform designers – intermediaries. A social phenomenon known as rational ignorance may also play a part, as, when people are not well enough informed, they rarely bother to participate. In a collaborative environment, valuing the individual micro-contributions means also creating network leadership models and self-organizing structures that enable processes as community building, creativity, responsibility, commitment and consensus. (Gorbis 2013)

Aiming to foster connections and motivate the participants in a large scale projects, the open innovation intermediaries typically use internet-based collective intelligence system platforms that allow global participation. As discussed in the earlier chapter about Platform Business, they can be rather diverse and complex, but their main features include information about the user roles, accepted transaction/reward mechanisms and trust-building and self-regulating mechanisms. (Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017) The users should typically be aware of the needs of solution seekers and offers of solution providers, and there may be a combination of incentives, from monetary rewards to reputational ones. Outsourcing and using collaborative platforms for innovation can bring enormous benefits to a city, or even a small organization – but it can also be somewhat difficult to choose with whom to connect and which solution to implement. Besides automated matching algorithms, a good strategy can help. (Bakici, Almirall & Wareham 2012)

4.1 Open and Collaborative Innovation Strategies

A city may decide on which forms of stakeholder engagement are most suitable for the development at a particular stage, or in the complete process. Decentralizing responsibility across the departments and smart city action fields helps to solve the challenges easier, also when cities become more mature. (Eden Strategy Institute and ONG&ONG Pte Ltd 2018)

Cities can generate collaboration possibilities between the public and private sectors, involving all the stakeholders and creating new business opportunities. As described in the further chapters, namely Chapter 4 “Open and Collaborative Innovation”, the multi-stakeholder network approach can lead to an increasing understanding of the needs that should be addressed, and more common goals, shared innovative solutions and transparency. It also lets the policies to be made more citizen-centric and effective. It is known that different cities are often slow to improve the stakeholder engagement and increase the

ways for communicating, as it might not always be a priority – but studies show that in the current top-performing cities, it is rather common to engage closely with the private companies and citizens, as well as research institutions and other stakeholders, in constructive ways. A way to increase creativity, is to increase the effective use of resources and data. For example, Helsinki being among the forerunners among smart cities in Europe, shares the city statistics online as Helsinki Urban Facts, which affects three neighbouring cities in the region. (SmartCitiesWorld 2018)

In the development process, the city may also decide which forms of stakeholder engagement and at which stage are the most suitable and can be implemented. Applying the collective innovation might not be the best option to solve any challenge, but mainly those with several involved action fields – such as economical, environmental, technical etc. (de Graaf & van der Duin 2013) A closed collaborative innovation, called “crowdsourcing,” is an alternative that is also becoming increasingly popular, as it is a hybrid of open collaborative innovation and producer innovation. The case can be that the “crowd” presents solutions to the problem of the producer, who then can select the best one. By creating a framework for protecting intellectual property rights, the single user innovation, and open collaborative innovation can also happen simultaneously. (Baldwin & von Hippel 2010)

Cities are often the best “connecting” parties of the stakeholders, with the capacity to manage collaboration of a network with regional centres of expertise. The governance structure can include:

- **the management team**, supervising the strategic guidelines,
- **a steering group**, giving advice from key organization and partner representatives, and
- **working/interest/project groups** including all the organizations, businesses etc directly involved in the implementation.

Although these structures aren’t necessarily based on specific customers, actions, or processes, they can be used as a starting point for new solutions and innovative collaboration structures that are centrally initiated by the city. (Ojasalo & Tähtinen 2016)

On a larger scale, the European Union has created a HERACLES (HERitage Resilience Against CLimate Events on Site) project that addresses challenges with the help of a modular platform – collecting information from a wide range of sources, including satellites, society, and aims to create more awareness about the climate change resilience. The project supports creation of new sustainable urban designs. Also, the knowledge gap

about local heritage that is often left to individual Member States, is being filled in this way. (European Commission, 2018) As a smaller scale – city example, Barcelona has a Smart City Business Institute (SCBI) that is providing “smart education” to schools and creates workshops for students, to develop apps that solve the smart city challenges. (Gorbis 2013) In some cases, the solutions can be implemented within a few weeks, but in others – it can take a year or more, depending on the value chain and processes between the stakeholders. In the cities, where extensive cooperation is needed, it can be most efficient to address a problem through applying both business and societal goals.

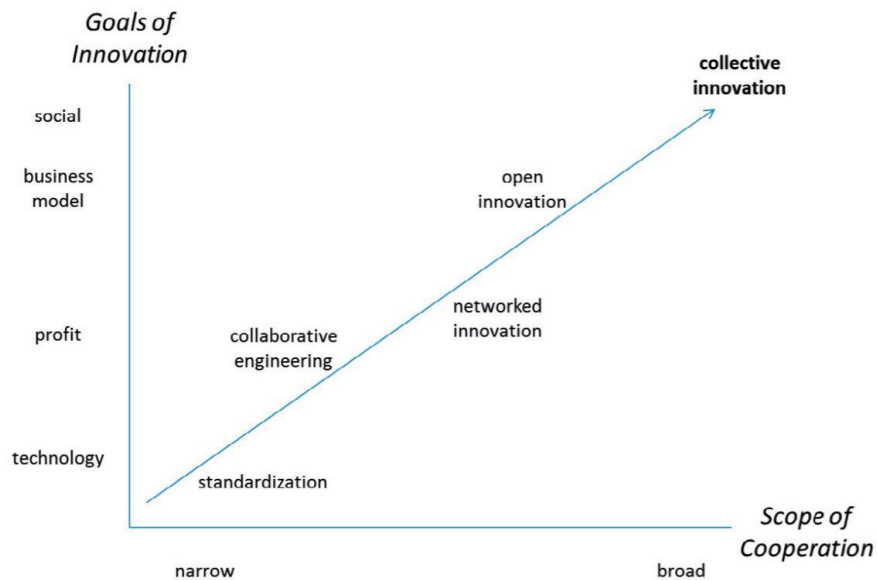


Figure 3. Various innovation approaches in terms of innovation goals and scope of cooperation. (de Graaf & van der Duin 2013)

As the figure shows, the goals and scope of innovation that is needed, can be used to effectively select the type of framework that would be the most effective, and it can be that depending on the city’s size and existing organizational structures, one size does not fit all. It can be observed that for technological challenges, standardization could be the best solution, and applying collective innovation to simpler problems without a social dimension might be time-consuming and less effective. (de Graaf & van der Duin 2013)

Opportunities and Benefits

A. Novel services/products/solutions

1. Unforeseeable innovation potential
2. Open data innovations
3. Sustainable solutions through long-term innovation partnerships

B. Economic gains

1. Cost savings to cities
2. Scalable solutions and services
3. Raising private money for public innovation
4. Better joint proposals for public funding of innovation

C. Urban and regional development

1. Favourable publicity and branding of cities and regions
2. Emergence of regional and national innovation clusters

D. Systemic improvements and process improvements

1. Learning and knowledge sharing
2. Citizen participation and bottom-up innovation
3. Innovation from the interfaces between actors from different sectors and industries
4. Fostering public-private-people partnerships
5. Potential of cooptation for companies
6. Change of attitudes and enrichment of jobs
7. Sharing city's infrastructure with external actors
8. New opportunities for startups and SMEs
9. Turning the whole city into an innovation platform

Importantly, citizens are often capable of much more than collecting data, when open data standards are applied. Although many cities are sharing large amounts of data, there are still barriers and steps to make the cities more transparent and participative. (Degbelo, Granell, Trilles et al 2016) Cities receive and store data as part of their public services, and even when the quantity of the data is large enough to function as “big data” it has to be used effectively, to create cost savings and enable the sharing of technology. With this, innovation can be adopted in several cities and further share the maintenance costs. Many of cities' problems are universal, and there are many opportunities of open collaborative innovation, that can be divided into four categories (see image on the left).

Figure 4. Opportunities and benefits of collaborative innovation with cities (Ojasalo & Kauppinen 2016)

Learning from others – best practices or failures, presents an opportunity to improve, and shared knowledge lessens the individual risks. When involved parties learn from and with each other, also the citizens are more engaged and their interest and general level of understanding rises. Interestingly, while startups are often embracing innovation and eager to partner, the city officials may face several problems to help them turn problems into products. In this regard, the following five are the most common challenges for the city:

- goal sharing challenges between city departments,
- process management challenges,
- organizational challenges for cross-departmental collaboration,
- resource allocation challenges, and
- reporting challenges.

This is impacted by cultural aspects in the organizational structure, and often risk aversion is related to biases, strong bureaucracy and silos. To minimize the burdens and enable collaborative innovation in cities, there is a four-option framework where the citizen-initiated versus company-initiated innovation and the targets of collaboration are compared. These four options can be used as strategic goals, in the context of implementing smaller projects.

- **Improvement of everyday life and activities:** initiated by citizens and aiming to improve what already exists. This option promotes offering tangible and intangible resources, rather than interfering or steering the activities in real-life contexts.
- **Creative consumer experiences:** initiated by citizens and aiming to create something new. Can also be supported by offering tangible and intangible resources, and preferably involves collaborative - creative and learning activities.
- **Experimentation and implementation of new technologies:** initiated by companies and aiming to improve what already exists. This option is best enabled by experiments and implementations in specific context, and often results in validation of new ideas and prototypes.
- **Creation or re-creation of new business:** initiated by companies and aiming to create something new. Using the city as a platform for creating new ideas, and enabling active collaboration between the stakeholders, systems and communities can create new business opportunities together. (Ojasalo & Kauppinen 2016)

4.2 Public- Private- People Partnerships and the quadruple helix

Despite rapid increase of collaborations and public–private–people partnership (PPPP) projects globally, the scientific research and existing knowledge about the processes is still quite scarce. Urban innovation is a key concept for any smart city, and it is closely related to larger collaborative processes, between government organizations, as well as public international stakeholders beyond. (Ojasalo & Kauppinen 2016)

As discovered in the previous chapters, a smart city is the result of many stakeholders working towards shared goals, and the partnerships can take different forms. The citizens

– people that are the end-users of the city’s environment, are at the center. Their roles, however, may be shifting depending on circumstances. Six main roles of a citizen include: voter, tax payer, local resident, customer, subject, partner. Furthermore, there are other categories indicating that citizens aren’t the only end users of the city. These categories include tourists, people that work in the city but live elsewhere and people that live in the region and visit the city from time to time. (van Dijk A. et al. 2015)

To go back in history a little bit, it’s necessary to mention that PPPPs have been developed from the simpler public-private partnerships (PPPs), as the larger society hasn’t always been considered as an important driving force in the development, as it is now. The PPP would be categorized into four types:

- operating partnerships;
- advisory committees;
- project partnerships;
- and strategic partnerships.

The strategic partnerships hold the most potential for far-reaching impacts in the long term, even if they may start from a single project. (Lebeck 2018)

In this thesis, author will focus on explaining the public–private–people partnership (PPPP) with three main stakeholder groups, as these are the three base groups of the economy, are well-understood in the cities, and are most prevalent in the related research. The **private companies** that produce goods and services for others, the **people**, that are individuals, groups and households, consume goods and services and are linked and governed by the **public administration** – often the municipality, or state. The interrelationship between these stakeholders is a separate study field in economics, and especially in connection with culture and globalisation. In the recent years, new forms of expression have also emerged, and the younger generations use digital media from an early age, expanding their cultural horizons and shifting from passive to active participants in many fields. (Einarsson 2016)

In 2009, the European Commission identified the socioecological transition as a major challenge for the international societies and economies. A different form of three stakeholder engagement – partnerships, is called a “Triple Helix” and similarly, very much linked to innovation and exchanged knowledge. It consists of **academia**, **industry** and

government as the three related parties. However, in more recent research, acknowledging the societal dynamics, it has been extended to Quadruple Helix and even Quintuple Helix. In the Quadruple helix, public and, respectively, **civil society** is included as the fourth sub-system with its values, experience and vision that promotes knowledge. (Carayannis et al., 2012)

In the Quintuple helix, the **natural environment** is decisive for providing the 'natural capital' for sustainable development.

As can be seen in the figure on this page, the Helix models have been developed in the context of knowledge economy, later enriched by the concepts of knowledge society and democracy and extending to socio-ecological transition at the latest phase. Each one of the levels is important, as sometimes the collaboration doesn't necessarily involve the other levels as active participants, although the society and environment are considered to be fundamental stakeholders that are impacted.

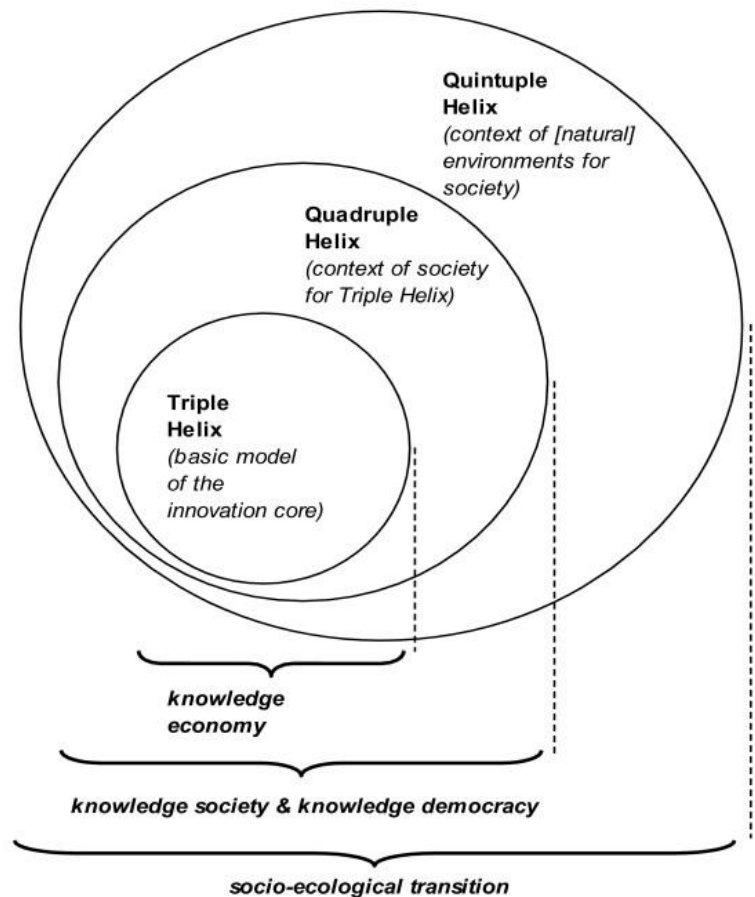


Figure 5. Knowledge production and innovation. (Carayannis et al., 2012)

The levels require coevolution of the stakeholders, and in the 21st century, the Quintuple Helix is showing the environment-conscious approach in the society that concerns sustainable development and should be viewed in a “glocal” perspective of knowledge exchange. The resource of knowledge is a key part of the model, as it circulates between the active stakeholders and is optimally used as the basis for further actions.

In the figure below, the Quintuple Helix is visualized with the knowledge streams, through the five helices or subsystems: education system, economic system, natural environment, media-based and culture-based public (society), and the political system (government) and through them, create innovation and foster sustainable development.

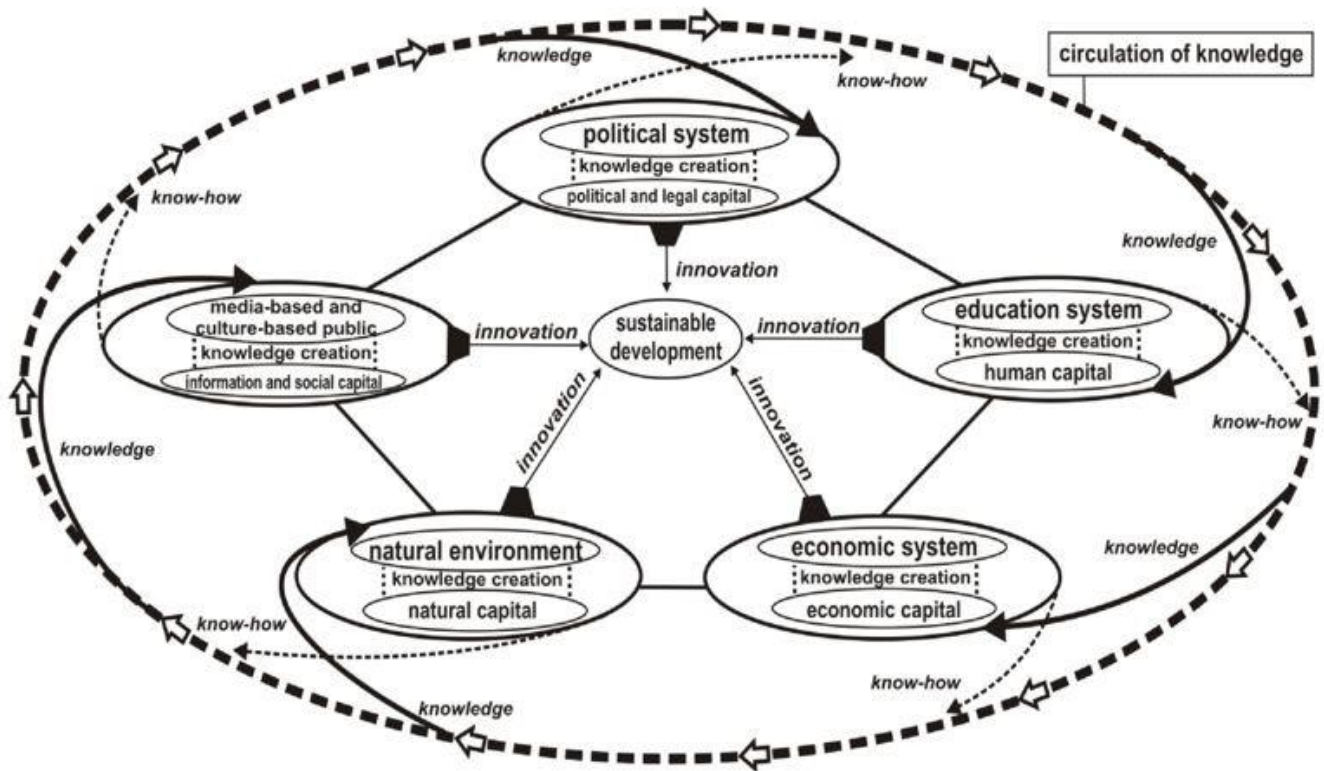


Figure 6. The Quintuple Helix model and its function (functions). (Carayannis et al., 2012)

Knowledge can serve both as a resource, as well as an input for advancing societies, and it can be stated that “(knowledge creation) also generates knowledge as an output, which then is being fed back (recycled) as a knowledge input”. The sustainable development in the center, indicated the need to coexist in balance with the environment and develop regenerative solutions, as well as promote sustainable use of resources that would meet the needs of the present, as well as future generations. (Carayannis et al., 2012) Notably, questions as “Whose City is it Anyway?” have been a discussion topic between researchers, and indeed, a joint collaboration is required from all parties. (SmartCitiesWorld 2019)

After reviewing the Helix models, it can be indicated that comparatively, the more parties are considered as valuable stakeholders and there is a potential for effective collaboration, the better. However, in the current models of partnerships that are predominantly formed in the smart city context, the PPPP model is the most suitable.

The three overlapping stakeholder groups between the Quadruple Helix and PPPP remain to be the public governance, the business and the civil society. The reason for not directly considering knowledge partners - academia and environment as much as separate stakeholders in this research, is that their contribution is, although on the very basis of innovation and development, is that in forming the partnerships and collaboration, the academic environment has been transforming in the recent years, and often becomes diffuse, and less formal – becoming also more connected with the businesses. The environment, on the other hand, is going beyond the social, political and economic considerations, and there is not enough available research about the models of collaborative engagement or defining it with the same framework as the other stakeholders. However, it is one of the six smart city action fields and is significantly affecting and being affected by smart city development.

Further on, in the formation and implementation of partnerships, that include the main characteristics of a successful partnership. The first layer – **information flow**, as can be seen in the figure below, is applicable to nearly any partnership, the second one – **conflict resolution**, is regarding the city and, specifically, resilience building context (without pre-defined stakeholder groups), and the third one – **stakeholder relationship**, is characteristic of any 4P aka PPPP (without the context).

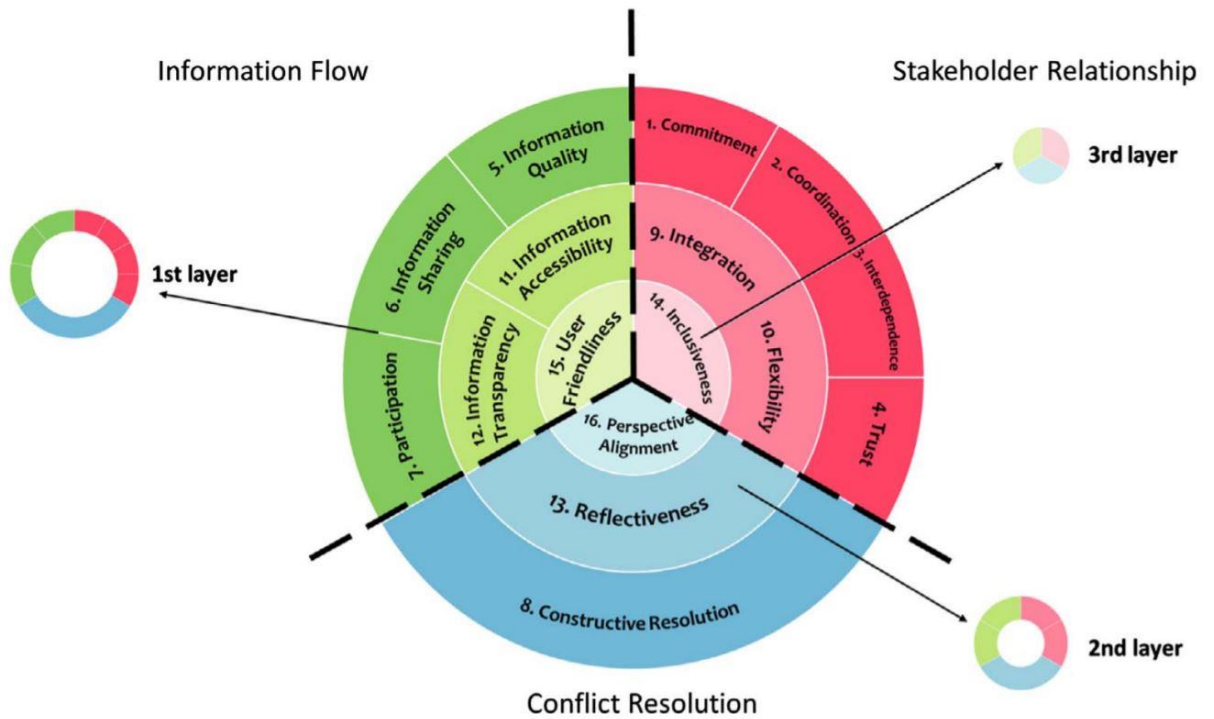


Figure 7. Framework showing the characteristics of successful 4Ps in the city resilience-building process. (Marana, Labaka & Sarriegi 2018)

The layers, or dimensions of the model include specific characteristics that can be used to plan, moderate or evaluate partnerships. In a smart city project, all of the characteristics can be taken into account, to make it most effective.

1. **Stakeholder relationship:** indicates the attributes and attitudes stakeholders should possess for a successful engagement: commitment, coordination, interdependence, trust, integration, flexibility and inclusiveness.
2. **Information flow:** characteristics that are related to the communication channels and effective use of resources: information quality, information sharing, participation, information accessibility, information transparency and user friendliness.
3. **Conflict resolution:** points out the techniques that can be applied to solve problems within the partnership: constructive resolution, reflectiveness and perspective alignment. (Marana, Labaka & Sarriegi 2018)

The model of successful 4Ps, could be very much supported by the application of modular design architecture in the city, that supports innovation distribution across geographical

and organizational boundaries, without adding significant costs, and is highly compatible with the concept of open collaboration. In the modular design, the original architect/s create a relatively small but functional core (platform) with a limited set of interfaces, to which new modules can be attached, as they comply with the specifications - even if they are made by others. The maximum scale of the design is mainly dependent on the amount and contributions of the participants. In open collaborative innovation, the projects possibly attract participants who don't necessarily intend to use the results but are willing to give their input for the intrinsic rewards, such as learning, reputation and fun. (Baldwin & von Hippel 2010)

Speaking of the different kinds of PPPP relationships that are the most common in the open innovation and smart city context, three types have been identified: **governing**, **sparring**, and **collaborative**. The collaborative model, which is most described in this research, is viewed as the potentially most effective one, but the city's context and different existing relationships and decision-making cultures have to be acknowledged. (Ojasalo & Tähtinen 2016) As the social environment changes, and the exchange of ideas is happening on a larger scale than ever, also the cultural influences are coming from all directions. Single events or places can become the center of attention, creating tension and demanding action globally. Also, the economy may be viewed within new borders and the communication language itself is evolving – currently with English, as the dominant language for globalisation, trade and science (Einarsson 2016)

5 User groups and their behaviour at bee smart city

As the author joined bee smart city in early 2019, there were more than 40 different customer personas, which could theoretically be grouped according to the quadruple helix model: with companies, cities, research institutions and citizens ; as well as the “public-private-people” partnerships model. However, there would also be several customer personas that need to be separated or could potentially be in more than one of the earlier mentioned groups. For example, competitors, smart city consultants, investors, press (local, national and international level), and conference managers. The approach to them, and the provided services would also be differentiated. For the stakeholder groups, starting with the simple public-private-people partnerships, it's necessary to understand that

their needs and interests are closely related and solvable through collaboration, although initially their perspectives are very diverse and even unique.

The key user persona groups are prioritized in the engagement process and depending on the ongoing projects, which means that some of the groups or sub-groups have a stronger relationship and use bee smart city more often than others. The general 12 user groups that have been identified at bee smart city are as follows:

Platforms	Press	Universities
Real estate	Organisations	Conferences
Citizens	Politicians	Businesses
Cities	Consultants	Investors

Table 2. User groups of bee smart city (2019)

Although not precisely the same, a very similar approach to dividing the actor networks in a municipality is shown in the image below, there are also 12 groups, 7 of which are almost identically overlapping. Although Municipality, from the platform perspective is one of the stakeholders, which would position it among others, it can be agreed that also in bee smart city, the networking and efforts are mainly aimed to help municipalities – local governments to become more developed and “smart”.



Figure 8. Visualisation of actor networks. (Borsboom-van Beurden et al. 2017)

While there are many cities with active citizens that are interested to participate and show initiative, there is also a lot of room for improvement and further engagement. According to studies (2016), citizens are most interested and prepared to help improving the infrastructure and services in the areas of:

- social services
- pollution reduction and environmental sustainability;
- waste collection, treatment and recycling.

These areas are connected to several industries that would also benefit by collaboration. However, only 15% of the citizens believe that they can meaningfully contribute in smart city projects. If there are more ways to interact with the cities (such as bee smart city), more than 50% would be eager to give feedback and share ideas actively. Usually, the social media and e-mail are the main channels for communication directed from the citizens to the city. As a comparison, businesses prefer to use more traditional means of communication. Although it is evident that using new tools requires more structured action, companies are mostly very positive when offered partnership opportunities for smart city projects, and 73% would be interested to sponsor initiatives that facilitate citizen engagement to improve the city's infrastructure and services. (Murray 2016)

On a platform ecosystem, the user interactions are significant, across different times – what they experienced from a city or a brand a day ago, might influence (or be completely different from) how they feel about it after a week – and yet, the data is available immediately if shared. In a similar way, trends are created and what is influential now, might be ignored after a short while. Understanding and accommodating multi-cultural social dynamics in contemporary digital context, is a great challenge even with powerful analytical tools, as in the digital environment, non-human actors are more than evident and have an impact that is hard to assess. Moreover, the use of bots and artificial intelligence created “performers” that contribute to creating online content and interactions, is rapidly increasing and the perceptions of it vary. (Lugosi & Quinton 2018)

6 The platform ecosystem of bee smart city

Bee smart city has many collaboration, engagement and interaction -enhancing platform features. Positioning itself as a platform that globally connects the city stakeholders, and contains useful material database with research, solutions that can be implemented, tenders, events calendar, as well as direct matchmaking and messaging features as the leading examples.

From the platform perspective, bee smart city is currently not so much of a digital marketplace but rather an open community, though having the vision and potential to effectively incorporate both. The company provides access to mainly intangible assets as knowledge, leaving the implementation of physical assets to the solution providers. In this, the marketplace is decentralised and providers of different solution categories can compete against each other, while the users can refine their search criteria and choose which solutions are a “match” for their situation.

The services are mostly free for the registered platform users, however, for example companies that want to be more present and share their message directly to their target group, or the whole member community, are welcome to use advertising services, as well as cities can access individually organised consultations and workshops, to co-develop their smart city strategy with experts.

The platform culture encourages peer friendliness and being respectful towards each other, and perhaps due to majority of users representing cities and companies, the communication is formal or semi-formal and the bee smart city representatives are typically friendly and supportive. There are also communications with regulatory authorities and larger organizations, to ensure regulation friendliness and build a safe and trustworthy place for fostering a smart city development that is beneficial to all stakeholders. While there is less of an official cooperation with other platforms, bee smart city is present on the major ones, including Facebook, LinkedIn, Twitter. In the occasion when here is a business collaboration with events or organizations that can also be considered platforms, it's also typically mutually beneficial and partnerships are formed.

As an innovation intermediary, mainly for the public sector – bee smart city helps to facilitate a systemic setting and provide the necessary stakeholder network to partner with, for projects that can be either very small and industry- specific, such as implementing a solution, or engage in larger long-term projects, such as creating a holistic smart city strategy that includes city’s own analysis, benchmarking, prioritization of areas that can be improved, and more, leading to a variety of public–private partnerships.

It can clearly be defined as an innovation intermediary, by having the three capabilities of:

- innovation process management – providing continuous support for collaboration
- matchmaking – as is needed in all the innovation stages and city development process
- valuation and portfolio management – as it is able to “translate” the combined value of smart city solutions and development collaboration options, into individual benefits to each one of the stakeholders.

(Ojasalo & Tähtinen 2016)

As recent research has shown, in the process of smart city development and new projects, managers have to explore a variety of sources and most significantly, 26% are businesses, 17% are city leaders, 16% are private utility companies, 13% - citizens and 12% planners. (Simpson 2018) This is a global need to ensure that the smart city projects are well-implemented and bring a considerable benefit to the city in long term. This also influences the possible collaboration opportunities between cities, and exchange of influences in the decision making. Bee smart city is an irreplaceable tool to access resources from a large variety of sources – including research publications and insights from cities, and as an innovation platform, helps to create the right environment for further knowledge creation and added economic value and successful partnerships, that involve co-creation.

6.1 Potential Challenges for Multi-Stakeholder Engagement

Communications between people, organizations, municipalities and beyond, have been evolving in many ways, during the recent years. Especially with the help of digital media and social networking platforms and sharing sites, people have been able to express their cultures, create and actively participate in social movements and much more. (Einarsson

2016) In the same time, cities have become more diverse and multicultural, and the need for new public collaborative models and innovation has only been growing. (Ojasalo & Tähtinen 2016)

While the cross-communication and openness of participative platforms can create new partnership forms and are a helpful tool in making strategic decisions, the public entities that are supposed to represent the society and its views, are exposed to the risks of miscommunication and misinterpretation of their existing realities and city's needs. (Marana, Labaka & Sarriegi 2018) The concept of living labs has become popular to experiment with implementing new solutions to urban situations, in smaller places with controlled environment and then, based on their success and analysis of the gathered data, the solutions might be implemented in an actual city. This, although an option with a high potential to see if a smart city solution can be generally effective in a situation, typically excludes the questions of culture. In a city, the inhabitants have to be involved to reach a consensus about the smart city vision and see how the city's history, emotional relations of people and city's own ways of engaging create a common vision. Importantly, "smart citizens" are not homogenous and there are several factors that require direct engagement instead of simple quantitative data gathering. (Rose 2017)

In a survey done by Smart Cities World and Philips Lighting in 2018, about managers stated that they are unable to implement a smart city programme, because of lack of capacity, and general expertise. Among others, some specific responses highlighted challenges as:

- budget limitations (23%)
- need for more supporting infrastructure (19%)
- lack of smart cities on short-term mindsets (12%)
- lack of political will (6%)
- lack of stakeholder support (5%)

While majority of executives are interested to engage with the public and seek feedback with user trials, consultations, focus groups, digital surveys and other forms, nearly 20% of them were not satisfied with the effectiveness of the feedback processes. There can be many reasons for this, which should be specifically addressed in their respective context. As one example, in 2015 a public consultation in the city of Agra, India, received only

10,000 responses whereas the population consisted of over 1,500,000 people. The main reason for low engagement rate turned out to be as simple as the lack of internet access. (Simpson 2018)

It has been proven, that applying big data and ICT solutions can make the city more functional, it doesn't necessarily make the city "smart" or improves the life quality of citizens. Having too much information available, can lead to confusion, poor decision making and simply be overwhelming for the city managers and citizens alike. (Allam & Newman 2018) Still, implementing new technology and creative changes is important and increases the overall knowledge in society. Creativity is inseparable from culture and arts, which, unsurprisingly make a large part of the economy in the 21st century. Some of the most well-known art forms and industries include architecture, interactive games, toys, software design and services, crafts, design, filmmaking, fashion, advertising and marketing, radio and television industries, music, print and electronic publishing and more, that are all much dependent on intellectual property rights. (Einarsson 2016) Projects of any scale are planned and implemented within a time and place- specific legislative and political context. When changed (which happens relatively often), it presents new additional expectations, need for negotiations and further issues for project adaptation. (Borsboom-van Beurden et al. 2017)

Open innovation poses a potential risk of losing competitive advantage, which can make organizations overly protective and create legal protection strategies that forbid knowledge sharing altogether. (Gould 2012) The deeper knowledge of the stakeholders, can become evident in any industry and scientific discipline, and it's inevitable to prevent. Innovations often share the following features:

- a high rate of technological change;
- a broad potential impact;
- the involvement of high economic value,
- and considerable potential for disruptive economic impact.

Technology can connect objects and devices globally, affecting the health, security and productivity of people with a massive economic impact. (Smart City Working Group 2013)

New solutions are generally unproven and unfamiliar, therefore seen as risky. Some potential challenges of specific stakeholder groups involve:

- **Public entities** might be afraid to make a bad decision with the public money, they may lack knowledge on costs and benefits, as well as be vulnerable to unforeseen and long-term risks.
- **Private enterprises** may suffer from lack of public demand, and lack of expertise about innovative solutions.
- **The public (end-users)** may be reluctant to adopt and invest in new solutions due to scepticism, concerns about the reliability of the solutions, as well as unwillingness to change their behaviour and learn. (Borsboom-van Beurden et al. 2017)

Stakeholders that are aware of how the city functions, can make a large difference. Therefore, one of the key solutions to the challenges is making the city's data more available and usable. Considering that the budget is often absent for researching and implementing technological initiatives, it can also show that there is a cultural hesitation and potential administrative complications. A city, understood in a geographical, social and economic sense, should focus on the scalability and consider the impact that successful collaboration could have on the macro level, as well as individual neighbourhoods. (Farsagli 2017) For any smart city project to proceed, it's necessary to have a collective agreement about the shared goal and a platform for the stakeholder engagement. (Borsboom-van Beurden et al. 2017)

6.2 Insights of the City Officials

As according to the research, the smart city development process is mainly initiated and carried out by the cities, after several discussions with the bee smart city team, the author chose to conduct the interviews with city representatives (Municipality managers, city mayors, after conducting an internal city officials – customer persona refinement to select the target persona. To mention the other stakeholders, such as citizens and researchers, they are, although influential and having a large impact in the city – currently, they are not a major part of bee smart city users and the engagement with them on the platform is currently in the development process.

The author also created an evaluation of the (hypothetical) needs, and a customer persona analysis with their responsibilities, challenges, tone of voice and other general data. The first listing and prioritizing of the needs and challenges was done according to publications available and the discussed observations by me and my colleagues that are working with this target persona – and the accuracy of which were to be tested in the coming interviews. Based on the earlier research, the author created a hypothetical overview of the tasks and city challenges for the interviewees, that were confirmed and are presented further in this chapter.

Initially, it was planned to conduct five to seven interviews with cities, as that would be sufficient to gain an overview for the scope and depth of this research. The author was interested to contact cities from preferably different regions and the created list of targeted city contacts was much larger than the planned five, to ensure that there would be enough responses, in the case of some interviewees being unavailable. Invitations were sent in three rounds. The first round included 21 recipients in July 2019, there were 6 recipients in the second round in August, and 14 recipients in the third round in September. As bee smart city provides advisory services to cities and is currently working closely with several cities in developing their smart-city strategy, the selection of cities was done with the help of bee smart city management, and the whole process, including author's prepared interview and approach e-mail were reviewed by her colleagues.

It was planned to do semi-structured qualitative interviews, lasting approximately one hour each, that would be recorded, while the responses would be anonymised. There was also a guiding document with general details about how the process should be organised, to ensure that the interviews are conducted in the same way. In a couple interviews, a colleague from bee smart city also assisted with taking turns in asking questions and recording. Some of the interviews were done in written form and exchanged via e-mail, and it was also offered to fill an online Typeform survey with the same questions, if there would be a problem with scheduling a call, or there would be any restrictions to downloading and filling the document form. Interview outline with all the questions can be found in the Appendices of this research.

There were successfully done seven interviews with representatives of **Tel Aviv, Winnipeg, Porvoo, Lublin, Melbourne, Graz** and **Los Angeles**. As it can be already noted, the cities are from different regions and not only their geographical location, size and

stage of development is very different but also the culture and city organisational structure varies. To be as possibly objective, the cities won't be compared between themselves, but rather the responses will be analysed by their quality and the frequency of similar responses will be addressed. It's important to note that in this chapter, the questions won't be reviewed in the exact order they were asked and one by one, but rather by topic group and content that is most relevant to this research.

The interviews started with stating the interviewee's current position in the city and main responsibilities in terms of smart city development. These were quite diverse positions, although the responsibilities were somewhat similar and equally important, in relation to smart cities.

In three cases, the interviewee worked and led the Smart City Strategy team and were specifically working with the promotion and support of new innovation projects, creating multi-stakeholder programs, dealing with possible partnerships and of course, developing the smart city strategy for their city. Besides the local and national priorities, one of these, was specifically focusing on the European Union - level possibilities and initiatives as well.

In two out further cases, the interviewee was actually a CTO (Chief Technology Officer), or CIO (Chief Information Officer), which are relatively new executive positions in cities, directly related to the smart city planning, implementation of new technologies and digitalization.

The last two out of seven interviewees were working in Economic and Tourism development, primarily focusing on the identification of what makes a community smart and promoting collaboration with various stakeholders. These were not positioned as official city employees in its departments but rather municipal organisations/companies that worked closely with the Mayor's Office or in some cases, the CIO, and acted as an interlocutor between industry and government. Although it might first seem that Economic and Tourism development is not quite the closes thing to smart cities, it is actually very focused on identifying the key fields that need more attention, investment or international talent attraction to foster the economic growth and it's especially important if the city is making their first steps towards becoming "smart" and developing a good strategy.

Overall, in six out of seven cases the working teams were ranking from 3-6 people specifically for the smart city division (or the closest relation to it), with the department itself being 10 to 44 people. They were evenly split in more specific teams for example: Open Data, GIS (Geographic Information Systems), Research and Insights, Smart City Strategy, CityLab and Knowledge Programming. In one case, there was no specific “smart city” unit but the staff altogether consisted of 450 people and 125 were working in relation to Apps and that involved use of “smart” technology.

Speaking of the interdepartmental collaboration, it was typically successful as each department and team had their own specific goals that others were aware of. Therefore, at least theoretically they could approach each other with specific questions or proposals directly. Asked about factors that may hinder the collaboration and create silos, the interviewees had their own different orders of “top three” but with explaining their situations, shared very similar opinions overall.

Many agreed that the silos and feeling of isolation is not intentional, but happens because of lack of effective communication platforms, and incomplete understanding of what the other departments can provide. It was argued that the allocation of responsibilities was not always functionally adequate but based on political goals. The fact that “smart city” includes a large variety of topics that can overlap with the other departments can make things complicated, if the employees are not aware of the competences of others and might start work on smart city projects, without knowing that they fall into the category. There are also different understanding of the KPIs and important outputs, which can be a problem in large projects, where the interdepartmental collaboration is essential. In some cases, the overload of work and intercultural difficulties were mentioned as problematic as well.

The overall top three issues hindering interdepartmental collaboration were:

- Many of the interviewees mentioned **continuous education and technological literacy gaps** as problematic.
- The **different locations of city offices and large size of departments** make the communication rather irregular and it’s hard to collaborate in long term.

- There is often **lack of available resources** – either financial or factual, which disturbs the cooperation, don't allow proper strategic development and implementation of specific projects.

Asked, if the city has their own “smart city strategy”, only two cities confirmed to have it as an officially approved part in the urban planning concept. Two cities had created a Smart City Approach and were currently working on developing a “smart city” specific strategy. The other cities (interviewees) found it difficult to specifically answer “yes or no” to this question. As they explained, there might not be a separate “smart city strategy” yet, but there is certainly a strategic approach and smaller projects towards it. In these cases, the cities aimed to start with including digital development in their new city strategies and attracting resources for improving one or few smart city fields of action. This would help them to make the first steps towards a larger strategic approach. In further examination, the strategic approach of these cities did include smart city concept and activities that would include participatory government techniques with various stakeholder groups, as well as the accordance with the idea “human-centric smart city 3.0.” – meaning, the approach is holistic and the residents are engaged in co-creating transformative projects.

In the next question, the interviewees had to rank the following tasks in order of importance and relevance to them:

- Getting budget approval and personnel for projects
- Political and city leader support
- Clearly defined priorities and goals – strategy for smart city development
- Knowledge about smart city best practices in other cities nationally/globally
- Expanding the partner network (businesses, universities, associations, other cities)
- Understanding the city's problems & citizen's urgent needs, willingness to collaborate
- Gaining Knowledge about best practice smart city strategies and projects
- Identifying specific solutions and potential solution providers
- Implementing solutions / upgrading technological & data infrastructure (e.g. LoRaWan, Mesh-Network, Urban Data Platform, 5G, etc.)
- Improving communication and collaboration between the city's departments (breaking silos)

- Increased transparency of the city's work and citizen engagement (co-creation, participation)
- Other/-s (please describe)

The most important one, that six out of seven interviewees placed in their top positions was **“Understanding the city's problems & citizen's urgent needs, willingness to collaborate”**. It was followed by three tasks that five interviewees placed on top, (non-specific order in the comparison) – namely:

- Getting budget approval and personnel for projects
- Clearly defined priorities and goals – strategy for smart city development
- Improving communication and collaboration between the city's departments (breaking silos)

This was followed by three interviewees emphasizing the importance of “Political and city leader support” and “Increased transparency of the city's work and citizen engagement (co-creation, participation)”. Last but not least, the highlighted points were: “Identifying specific solutions and potential solution providers” and “Implementing solutions / upgrading technological & data infrastructure” were agreed to be of top importance in two cities. Some of the “other” tasks included socializing about smart intelligent community principles with the community.

As for the current and potential city challenges that the interviewees aimed to implement in an intelligent way, each city representative was asked to list of approximately five things that were important to them. As this was one of the open questions, the responses were mainly collected as highly qualitative explanations, including some of the things that cities would aim to do to solve their challenges. Thus, noticing the tendencies and comparing similar points in the responses, the author decided to group them according to the six strategic smart city fields of action and organise them according to the prioritized mentions by city representatives.

Smart Living – five of the respondents stated that the social inclusion and minimization of social gaps is a challenge that could also be solved in their cities. For example, understanding the needs of less represented society segments and approaching people in rural areas, unemployed people, the homeless, or people with addictions to mention a few.

They were interested to maintain flexibility and saw the need to make adjustments in order to become a more cosmopolitan city.

Regarding the living conditions, there were three mentions of making the cost of living more affordable, and providing more / better modern housing solutions, which would also be resource-efficient and promote sustainable use of water, heating, gas, electricity etc. As the smart living was also indirectly (not as a separate point) mentioned among other factors by the remaining two city representatives, this can be considered a major field of action.

Smart Governance – five of the interviewees agreed that they are looking forward to digitalize their services and possibly develop or search for platforms with multiple product options as - CRM/case management, cloud service providers and other specific solution providers, as well as systems that would help them with data organisation and ease the work for the city employees. They were eager to provide governance services in a timely and meaningful way, as well as two of the cities were specifically interested to foster the government transparency with the help of Open Data and similar practices. Systematic prioritization of challenges in the city, was also mentioned.

Smart Mobility – including improvements for public transportation, MaaS (Mobility as a Service) and things like optimized and advanced infrastructure for electric mobility were mentioned by four cities.

Smart Environment – was mentioned by three of the interviewees, willing to improve urban sustainability due to growing population and climate change. More specifically, this was explained as reduction of CO₂ (becoming CO₂ neutral) and sustainable management of the natural resources, as well as increasing the overall quality of the natural environment. Also, there were several mentions of better infrastructure investment decisions, increasing energy efficiency and for example, applying smart grid energy measures.

Smart People – stated as important by three cities, was very much connected with the data and cyber security, as well as digital literacy in the community. The maintenance of privacy was seen as a challenge and some of the cities were interested to partner with higher level organizations, such as DHS (United States Department of Homeland Security Government department) or FBI (Federal Bureau of Investigation).

Smart Economy – was mentioned only by two cities, but is still seen as quite important. This included generally as driving economic growth, as well as increased connections with regional partners. This would help building the resilience of the city and foster innovation as well.

As seen in the previous questions, and corresponding with the main topic of this research, it was asked to the city representatives to evaluate the importance of engagement with citizens and other stakeholders to facilitate collaboration. All the interviewees saw it of utmost importance and even as the basis of their city strategy. Majority of cities preferred online engagement in the form of social media to raise awareness in the general society, then targeted surveying and direct communication when working on specific projects. The direct communication was mainly aimed at the local partners and private sector, although there were also practices like workshops and city labs – to engage with the community and test or co-develop ideas. It had proven to be an effective practice to involve the city inhabitants in decision making process and create better solutions. Two city representatives expressed they were also active in the academic community, from schools to universities. Overall, the stakeholder engagement was seen as extremely important and effective, but also resource intensive.

Further on, it was asked to evaluate the current collaboration effectiveness with the city's stakeholders and external partners with ranking the following:

- Academia, research institutions (local and international)
- Private sector local stakeholders
- Private sector international stakeholders
- Citizens
- Other local public sector stakeholders
- International public sector stakeholders
- Other (please indicate)

Here, comparing the results by which of the points appeared in first positions repeatedly, the most effective as agreed by six of the interviewees was with **other local public sector stakeholders**. It was followed by **citizens** in the second place, and **private sector local stakeholders**. After that came equally important Academia, research institutions and

the international public sector stakeholders. No one mentioned that there is effective collaboration with the private sector international stakeholders.

It was also asked in the interview, about the top online and offline sources where they acquire information about smart city topics, solutions, and best practices. It was approved that the city representatives see it as one of their main responsibilities to stay up to date with the local landscape and newest research about intelligent communities. Different partnerships showed to be an important source of information as well. Below are the key mentioned sources (no specific order).

Online sources:

- smart city solutions accelerators (as bee smart city);
- webinars and courses on e-learning platforms;
- thematic pages with blogs and forums (as Smart City Dive, Smart Cities Council, Mastercard City Possible)
- other thematic articles, scientific webpages, including local government documents and publications.

Offline sources:

- contact database created by the City Office, own international partner network and membership in transnational networks and strategic groups (as C40 networks, ICF)
- direct communication with smart city service providers (businesses and organizations)
- strategic conversations with the representatives of other cities;
- collaboration with academic institutions
- conferences, networking sessions and other thematic international events
- challenges and solutions brought up by the public

Most of the interviewees didn't use bee smart city as their main source for information, networking or other purposes in their daily work, and some only heard about bee smart city when agreeing to participate in the interview. Although several of them had found appealing smart city solutions in the platform database, none of the cities had implemented specific solutions from bee smart city in their city and couldn't evaluate the effectiveness

of the solution database. However, the feedback from those who had used the platform was very positive and all of the interviewees showed interest in the solutions, case studies and global insights. Seen as a great source of inspiration, it was also mentioned as important that bee smart city is a community that is characterized by openness and willingness to cooperate. Author noted that at the time of interviews, there had just been released a few feature that lets registered members connect with each other by matchmaking (based on “seeking”/ “offering” tags) as well as a beta version for messaging. This was mentioned to the interviewees, but the majority of them had yet to try it and could not evaluate it, although there was expressed interest by several of them.

To the respondents who were familiar with bee smart city, additional questions were asked, to make suggestions about other content or features on bee smart city that they would see as helpful in their work. A condensed list of suggestions is shared below:

- Tools for benchmarking between individual cities. These could have the option to modify specific variables.
- Possibility to obtain information on which areas are developed in the city and ones that need improvement.
- Educational materials about the concept of smart city, which could take the form of webinars, podcasts, textual studies, etc. The team working on the bee smart city platform has all the competences to run such a module.
- Considering new possibilities of integration within the bee smart city community. For example, besides the presented solutions users could share important information or events in line with the specific smart city topic.
- Let organizations advertise their initiatives and convey what partners they expect. This could significantly help facilitating the possibilities of broader networking and enabling the promotion of associations, non-profit entities, consortia, etc. through the platform, will bring a large added value in the process of networking.
- Legal regulations are often seen as problematic in the case of international partnerships. Cities as public entities have legal provisions and there could be some advice for what smart city principles are for jurisdictions to embrace.
- Cyber protection for the network and for the personal information and privacy of the data that is collected, stored and used.

- Advice regarding solution implementation, since what works for one city might not necessarily work in another one as-is, without making adjustments.

To conclude, the city officials and people working with city development, are aware that they should look into a large variety of topics instead of focusing solely on their niche area. Prioritization of challenges and tasks is important, and so is the active engagement with city's stakeholders. A platform like bee smart city can be game-changing for nearly any city, regardless the phase of development, as it provides a large variety of services and solutions. In the following part of this research, the author will continue with suggestions that could ease the multi-stakeholder engagement on bee smart city.

6.3 Suggestions for Facilitating Successful Multi-Stakeholder Engagement on bee smart city platform

In order to facilitate engagement and transactions between consumers and providers on a platform, as well as grow the user base, it's necessary to foster a sense of community, that functions in the online environment, as well as offline. For a platform like bee smart city, the community consists of the registered members, the social media followers, newsletter subscribers, direct contacts, that can further be divided in the stakeholder groups of cities, organizations and companies, individuals etc. In the smart city development perspective, it has been shown that the participants are more interested to engage, when the platform is open for interaction, they can access valuable information and contribute in a meaningful way. Respectively, if the public sector has an open approach and promotes public consultations, the citizens are more willing to become co-creators in the process. (Pereira et al. 2018)

As explored in the previous chapters, open collaborative innovation thrives when the platform involves motivating reward structures, and they are especially effective when focusing on intrinsic motivation instead of extrinsic rewards. As an example, gamification elements as rankings, badges, or other virtual rewards for active engagement and successfully completed tasks can be implemented. (Stanoevska-Slabeva, Lenz-Kesekamp & Suter 2017)

To ensure that the relationships between the stakeholders are creating practical value and actually helping the cities to become smarter, the engagement process should be within a

positive ethical framework and ensure that the community members are informed about how their participation can be the most effective, and what are the outcomes they can expect. As a learning from the “Gang of Four” leading platforms, social activities foster economical ones and in the case of Apple, group discussions about topics like solution implementation or events, ultimately lead to sales. It could be a good approach to combine the social nature of Facebook, e-commerce functionality of Amazon and the search capability of Google (Simon 2011), altogether designing a joyful and productive digital experience. Although it might sound like a very general suggestion – bee smart city practically has already implemented the basic features - planks of these leading platforms. Respectively, there is a search functionality for smart city solutions (database), and city best practices, there are social networking features as matchmaking through “seeking” and “offering” tags, as well as messaging options, and opportunities to promote specific solutions, services or events on the platform as posts or articles, to encourage discussions and sales. Since a lot of information, such as tags are provided by the users themselves, the match-making effectiveness is provided by technology. By collecting the data about common interests and reviews – things as simple as “smarts” (likes) on the platform solutions can show the existing trends. Potentially, predictive technologies could be able to generate solution groups based on their ratings and categories, recommend content to the users, based on their previous actions, and apply collaborative filtering.

Studies show that there are four main options for how an innovation platform can influence the decision-making processes of the government:

- The innovation platform can be subordinate to the central government of the city.
- One or several of the city departments may have their own innovation platform(s), which are subordinate to them.
- A connecting entity is added to the previous option within the city government. The purpose of this connecting entity is to share ideas, practices, and visions of the service innovation of each department’s innovation platform.
- The innovation platform is externalized so that a governing relationship does not exist with the city or it is weak.

On bee smart city, as an international platform, the main characteristics are currently closest to the third and fourth option. With the fourth option currently being most applicable for the wide-range engagement, empirically it can be suggested that the engagement is most

effective for fostering engagement in the first option. Although there are direct relationships with city governments, the partnership can't be clearly considered as subordinate and the engagement on the platform can be initiated by one or several departments of the city. Also, the capacity of bee smart city as a company, to engage with cities through strong direct innovative collaboration is limited. Provided that bee smart city is a neutral intermediary in the most processes and offers the technological features, as well as the access to larger community, author recommends that the engagement frameworks can be discussed and modified with the help of city representatives, to enable creation of smaller innovation platforms – groups for facilitating the multi-stakeholder collaboration with the direct support and implemented vision of the city's management. (Ojasalo & Tähtinen 2016)

Bots and Artificial Intelligence are widely used on social platforms to distribute information and have a great influence on what information is presented, when, and to whom.

Through a variety of interactions, including liking, sharing, following and commenting – users can not only express their preferences and views, but position themselves in the community's hierarchies. This means, that the more active, skilled, qualified or otherwise status-diverse members may be more visible and influential than others. This has been the case of social media and review platforms, made effective through algorithmic coding, indexing and valuation. (Lugosi & Quinton 2018)

Not only for the city representatives, but also other user groups, it's important to build trust and provide verification of information about their identity, contact information, qualifications and references. This is especially relevant for cities, that would be interested to claim their official pages and for example, share their needs and success cases to effectively engage in new projects. This is also important for service providers and organizations that want to generate leads and reach new markets. Although bee smart city doesn't yet enable transactions on the platform, this has been considered as a potential future goal. As a related point, the control of illegal actions and content, as well as tools to limit user actions if they are harmful, should be considered in a risk management plan. (Frey, Trenz, & Veit 2017)

Ensuring transparency in the city environment, just as well on the bee smart city platform, the members should be aware of the ways their data is managed. Although there are laws

and regulations such as General Data Protection Regulation (GDPR) and similar, few citizens are aware of the existence of data brokers, and the ways in which they are involved in the data flows. In the most cases, by entering a website or registering on a platform, the consent to share their data and enable “cookies” for example, is by default. This goes beyond platforms as the option not to use the services, apps, smartphones etc. that are connected systems, is unlikely to be beneficial, even though considered protective by some. Both a popular and effective solution is applying “nudges” and simplifying the decision making through default options and triggering actions that are supposed to be the most rational. (Gandy & Nemorin 2018) In the case of bee smart city, the choice architecture exists even in the display of information. It shapes the platform environment and things like the landing page – triggering visitors to scroll down, subscribe to the newsletter or register and create their own profile. Similarly, rearranging the content in social media posts, or the tenders – like request for proposal (RFP) design, could be encouraging people to become more active. More specifically, research suggests that with by adding emotional engagement, storifying, emoticons, as well as presenting the criteria in a specific order, or presenting examples of certain risks, increases the attractiveness of certain options and makes it easier for users to show activity. (Harris, Shealy & Klotz 2017)

For city representatives as users, decision making and motivation for making investments into certain projects, is currently one of the main reasons to use bee smart city. They are looking for best practices and references for solutions, where, by evaluating them and projecting the potential benefits to their own city would do good. (Borsboom-van Beurden et al. 2017) On the platform, there is a large solution database and search and filter them by the location, smart city indicators (action fields), tags and more. Registered members can also see the spatial level, approach and detailed description of the implemented solutions, together with the contact information and website if they are interested to take further actions. As there are solutions implemented in several cities, and providers might be interested to expand, this information also could be presented.

The companies are a large group on the platform, interested to reach out to cities – buyers of their solution. For them, information about who they are, when and how they are best to approach (or how to gain their interest) is a key factor. For getting across information and networking, bee smart city shares the solutions in the page and social media newsfeed, and it’s possible to also network, through the matchmaking and database.

However, a significant factor for the city – as a customer, is knowing the viability and success, and the reviews (or smarts/likes) by users, as well as potential distance affect the views. (Einarsson 2016) To persuade cities that are further away from where the solution has been implemented, might be more difficult than when they are in the same region – considering the companies are typically SMEs, and the varying international regulations. Perhaps, there could be additional information on the platform about how easy it is to go through the process and what the potential customer journey from the city’s perspective would look like. The author proposes creating an article, infographic, video or otherwise shareable materials that explain the smart city transformation process in simple steps, and specifically show the process from city’s and/or from company’s perspective how the solutions are added to bee smart city platform, found and then implemented. This could be an educational and encouraging material that both lets the users better understand the functionality of bee smart city – highlighting specific features, as well as, virtually shows the best case scenario that they could follow. Also, users could be engaged in a campaign to share their “smart city journey” through a video or photo story (or similar, visually appealing way) and introduce themselves to the community, share their expertise, express their interests etc. A campaign like this, could be very effective on other platforms – social media as well, and activate the existing platform members, as well as attract new ones.

Geo-fencing could be an effective way to promote events and location-specific solutions, as well as other offers. As many of the government decision makers are also using a variety of devices and the increasingly, younger people take high positions, it could be a good idea to have some of the platform function in the mobile / tablet mode with an app. For example, it could be the matchmaking and messaging features, or receiving updates about a smart city topic as newsfeed. It would likely be possible to also implement the option to connect the smart city events calendar listings with personal calendars – and as there are quite many of them, all over the world, the events could be added one by one to the calendar by the user.

Last but not least, the personalization of the message and ways how bee smart city engages with the users can be rather time-consuming and sometimes, account-based marketing (ABM) is one of the tools that help with personalizing the message and timing. At bee smart city, building relationships with multiple stakeholders at once, is the key and the more important, as the reach of the company is very large and international. Platform, just

like large events, has the ability to bring together all the stakeholders of the smart city development process, and allow them to network, do business and learn from each other. Besides the publications and possibility to engage in direct messaging, it would be useful to host group activities, from webinars to forums, small-scale live events (besides city workshops), or topic-specific hackathons that would involve a variety of user groups and let them experience how it is to work together for a common goal and share their perspectives in a highly collaborative environment.

Discussion

Smart cities have become a prioritized topic among governmental organizations, academia, policy makers and industries, and are being studied continuously. This poses a need to make the research available for a wide range of disciplines and share the existing initiatives and efforts, to enable more effective development and avoid the risks of duplicating work. (Degbelo, Granell, Trilles et al 2016)

As discovered in the interviews conducted as a part of this research, the cities face a diverse range of challenges and often create their smart city strategy to match their unique environment, priorities and abilities. Though there are many common considerations and learning and collaborating with each other – through initiatives and projects, as well as potentially on the bee smart city platform, has a high potential value.

Currently, the government is the main initiator for smart city projects and has the dominant role in purchasing the products and services from private stakeholders. It can be expected that in the future, the smart city development will be more market-oriented and more PPPs will be realized, while the role of the government will focus on standardization, planning, regulations and similar tasks. (Li, Lin & Geertman 2015)

From the smart city development perspective, the first step is to understand the city's situation, followed by generating a common vision of what a "smart city" would mean for the specific place. It's important to benchmark and learn from best practices, however with keeping in mind the infrastructure and cultural differences. For this, the smart city rankings

are a great tool, both in the scientific researches, as well as on the bee smart city platform. Although the “perfect” city doesn’t exist and there will always be new challenges and solutions needed in the most developed cities, good analysis and harmonious growth are essential. Naturally, changes in a city happen over longer time periods and beyond implementing technological solutions, the society’s participation is fundamental.

As mentioned in the beginning of this research, the author has proposed incentivization mechanisms to optimise the engagement of the target groups – smart city stakeholders – mainly on bee smart city platform. The stated questions about:

- what is the most effective way to classify and group the smart city development stakeholders;
- in what ways these groups are engaging with each other and applying open collaborative innovation principles;
- and how can the bee smart city members use the platform for effective collaboration and smart city development,

have been answered within the chapters in a structured way that aims to explain the related concepts such as platform business and public-private-people partnerships, and make this research as possibly clarifying to the readers who are not consciously engaged in smart city development in their daily life. While, there could be additional and in-depth approach used to implement the methods for stakeholder engagement as proposed in earlier chapters, this thesis research is meant as an informative and encouraging basis for making further strategic decisions and accelerate platform development.

In some cases, it might be that the earlier stated stakeholder groups don’t capture all of the unique categories involved, and in the open innovation process, their roles and importance might shift. It’s possible that the participants can be seen as primary or secondary, depending on their affiliated functions and involvement in specific project. (Gould 2012) Due to this, it’s recommended to recognize the stakeholder groups first within the base framework of public-private-people partnerships, or the quadruple helix, and in-depth in the planning process, as well as re-evaluate the participation in the further development steps, and testing phases.

In many cities the “rise of the smartivist” can be observed, as people become more actively engaged with the city development process on a voluntary basis. Although this term wasn’t explicitly discussed in this thesis, it is one of the forms of citizen engagement,

which, has proven to be of key importance to cities. Smartivists, by supporting and potentially establishing their own initiatives towards contributing to the city, usually have a strong self-identification with the city – and community, can have a great impact on the collective intelligence efforts and help the “smart city” implement solutions and reach goals in specific fields much easier, as well as motivate the other community members to be more active, by raising awareness. The commitment and contribution of them may be recognised by the local governing authorities as well. (bee smart city, 2019)

The key focus point of this study was to emphasize the importance of intelligent community building and applying technological solutions and platform as basis for successful stakeholder collaboration on a large scale. Considering the diversity of the member needs and city environments, bee smart city is already providing a rather large variety of services and features that serve the main target groups. However, as taking the examples of currently leading platforms as Google or Facebook, there are many insights to be made. Although their main focus is not smart cities specifically, the amount of active members and market influence should not be underestimated and, the cross-platform communication can be very effective.

There is a clear demand for a platform that would enable effective networking and collaboration between stakeholders on a global lever, and bee smart city is currently the leader in this field. Considering the impact of technology and the fact that platforms are offering a variety of yet unexplored opportunities, it’s important to keep the performance quality high and foster growth in a stable way. From the business perspective, this means setting long and short-term goals, establishing a strategy, implementing it step by step, as well as monitoring it regularly. The implementation of the suggested platform features would have to be discussed further between the managing partners of the company and potentially, smaller steps can be included in the development plans and made available to the bee smart city members already for the year 2020.

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Appendices

Appendix 1. Interview Outline

Interview Outline

The aim of this interview is to identify the challenges and needs of city officials that are making their cities smarter and of course to benchmark and improve our services, as we want to make it easier for cities to become smarter, more livable and sustainable.

For your support, we will share the research results with you once we have completed and analyzed the results.

Questions:

1. Could you please state your current position in the city and explain what your main responsibilities are in terms of smart city development?
2. How many people are in your team / the city's smart city unit working on smart city development?
3. Are the city's departments collaborating in the overall smart city efforts? Which departments or government affiliates (e.g. Public-Private Partnerships) are involved?
4. How does the interdepartmental collaboration work out? Are you communicating and collaborating openly or is the collaboration more complicated?
5. What factors do you think are hindering interdepartmental collaboration / creating silos between the departments? (Please state the Top 3 factors.)
6. In what way are the smart city efforts backed / supported by the city leaders and the council (e.g. approved resources, strategy)? What would you say are the most important support factors?
7. Does your city have a smart city strategy or is currently developing one?

8. Many cities find it challenging to get budget approval and personnel for smart city projects and initiatives. What about you?

9. Please rank the following tasks in order of importance and relevance for you (most important on top):
 - a. Getting budget approval and personnel for projects
 - b. Political and city leader support
 - c. Clearly defined priorities and goals – strategy for smart city development
 - d. Knowledge about smart city best practices in other cities nationally/globally
 - e. Expanding the partner network (businesses, universities, associations, other cities)
 - f. Understanding the city's problems & citizen's urgent needs, willingness to collaborate
 - g. Gaining Knowledge about best practice smart city strategies and projects
 - h. Identifying specific solutions and potential solution providers
 - i. Implementing solutions / upgrading technological & data infrastructure (e.g. LoRaWan, Mesh-Network, Urban Data Platform, 5G,...)
 - j. Improving communication and collaboration between the city's departments (breaking silos)
 - k. Increased transparency of the city's work and citizen engagement (co-creation, participation)
 - l. Other/-s (please describe)

10. What would you say are currently the top 5 challenges / problems you need to tackle in a smart way?

11. Do you have specific overarching goals that you would like to achieve in terms of challenges and opportunities? (e.g. climate-neutral community, ...)

12. How important is it to you to engage with citizens and other stakeholders, and to collaborate with them in order to solve problems and achieve goals?

13. How do you assess the city's problems & citizen's needs? What forms of engagement and participation do you use (offline and online)?

14. What are the most common ways you prefer to engage with citizens and other stakeholders? Why?

15. Where do you inform yourself about smart city topics, solutions and best practices? (Please state the Top 5 sources – offline and online)

16. Do you think the bee smart city platform is useful as a source of information about smart city-related topics and best-practices, and why (or why not)?
17. What other content or features on bee smart city would be helpful to you for better fulfilling your daily smart city work?
18. Have you found some solutions for your city on the bee smart city platform?
19. If yes, - have the solutions been implemented (or are they scheduled for implementation), and how satisfied are you with the results?
20. How do you evaluate the current collaboration effectiveness with the city's stakeholders and external partners? (please rank, with the most effective on top)
 - a. Academia, research institutions (local and international)
 - b. Private sector local stakeholders
 - c. Private sector international stakeholders
 - d. Citizens
 - e. Other local public sector stakeholders
 - f. International public sector stakeholders
 - g. Other (please indicate)
21. Can you name a few typical issues regarding your local and global partnerships?
Please elaborate!
22. Have you been using/considering the bee smart city platform for expanding your network and establishing new partnerships?