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Enhancing Smart City Replication by Adopting an Entrepreneurial Ecosystem – A Case Study

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Achtergrond/context van het rapport of product:
Because of urbanization and the pressure on the quality of life in cities that comes with it, it is relevant to know how smart city initiatives can be encouraged. This thesis looks at smart city startups and how their business models can be replicated to other (European) cities using the Smart City Business Model Canvas.

Kernvraag:
Can an ecosystem that supports a bottom-up, entrepreneurial-driven approach help to overcome the challenges of smart city replication?

Samenvatting/opbrengst:
I develop an adapted framework version based on the established Entrepreneurial Ecosystems, as well as multiple smart city frameworks. The goal is to help city developers to passively attract smart city solutions and solution providers to actively seek out fitting urban environments for successful replication. I test the applicability in a case study within IRIS Smart Cities. I help a Swedish mobility company decide where and how to replicate their solution. First I test the ecosystems of five European cities for replication potential. Then I change to a more project-centered perspective using the Smart City Business Model Canvas. This tool helps me to understand what specifically makes the solution viable and which factors must align to allow for replication. Based on these analyses I provide recommendations on replication opportunities. I compare the two tools and come to the conclusion that either tool by itself is insufficient to give a good recommendation for replication in this case study.

Tags:
Smart City; Replication; Entrepreneurial Ecosystem; Case Study

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Master Thesis U.S.E

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Abstract

Due to the increasing rate of urbanization and the threats posed by climate change the urban way of life must be made more sustainable. The EU identified smart city innovation as one of the tools to do so. Although there are many smart city initiatives, urban planners mostly develop local solutions instead of replicating existing best practices. In this paper I offer a new perspective. I develop an adapted framework version based on the established Entrepreneurial Ecosystems, as well as multiple smart city frameworks. The goal is to help city developers to passively attract smart city solutions and solution providers to actively seek out fitting urban environments for successful replication. I test the applicability in a case study within IRIS Smart Cities. I help a Swedish mobility company decide where and how to replicate their solution. I apply two methodologies: first I test the ecosystems of five European cities for replication potential. Then I change to a more project-centered perspective using the Smart City Business Model Canvas. This tool helps me to understand what specifically makes the solution viable and which factors must align to allow for replication. Based on these analyses I provide recommendations on replication opportunities. I compare the two tools and come to the conclusion that either tool by itself is insufficient to give a good recommendation for replication in this case study. It is in their combination that these tools provide valuable information of how and where an existing smart city solution can be replicated.

Keywords: Smart city solutions, replication, entrepreneurial ecosystem, case study

JEL-codes: H41/H42, H54, O35, O38

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Introduction

In this paper I propose a new framework to enable smart city replication. My starting point is based on Entrepreneurial Ecosystem Analysis (EEA), developed by Stam (2014, 2018). The EEA can be used to enhance a city's ability to attract smart city entrepreneurs. Furthermore, I apply and compare EEA to the Smart City Business Model Canvas (SC-BMC) as developed by Giourka et al. (2019), in a relevant case study. The case study is part of the IRIS Smart Cities project. IRIS Smart Cities is a project by the European Union (EU) launched in Utrecht (NL), Gothenburg (SE) and Nice (FR) in October 2017 as part of the Horizon 2020 initiative. The main goal of this initiative is to address crucial urban development problems based around six clusters. These include sustainable districts and built environment, sustainable urban mobility and citizen engagement (irissmartcities.eu, n.d.). After establishing the proposed solutions in the three lighthouse cities they will be replicated to four follower cities: Vaasa (FI), Alexandroupoli (GR), Santa Cruz de Tenerife (ES), and Focsani (RO). The project not only seeks to successfully test and establish the smart city solutions themselves but also transfer these solutions first to the follower cities, and ultimately replicate them across Europe. This approach would allow the EU to achieve a maximum return on their smart city solution investment. In order to stay true to the project's perspective, the paper is discussing smart city innovation exclusively in the context of the EU.

Within the EU about 85% of the population is expected to live in cities by 2050 (Kotzeva & Brandmüller, 2016). Along with increasing urbanization come challenges facing the cities of tomorrow. These include an aging population, cultural shifts, climate change threating urban ecosystems, overconsumption of non-sustainable resources and the deterioration of social cohesion (Cohen, 2006). These are some of the key problems the EU identified and are being addressed using smart urban developments (Europa.eu, n.d.). The proposed solution: smart cities. These use a combination of infrastructure and technologies (information and communication technology (ICT) and the Internet of Things (IoT)). Think energy positive housing, electric car infrastructure, city-spanning public transport or citizen-cocreation.

Globally many governments facilitate and enhance the process of smart city development using investments and regulation (Alawadhi et al., 2012; Anthopoulos, 2017). However, regarding one major issue progress is slow: many cities experience similar problems, but smart city solutions are almost always developed locally. I.e. just as important as the actual smart city development and integration is scaling and replicating existing solutions to make the best use of resources invested and knowledge gained from already established solutions. As Björn Westling, the work package leader from the IRIS Smart City project, put it: *"Replication is the quest for the Holy Grail: everyone is searching but no one seems to be able to find it."* Ultimately, adopting best practices across the EU will require to better understand and overcome the challenges of replication. The EU has made clear that replication should at least be a partial focus of new projects and funding is now oftentimes conditional on it being addressed in the project proposal (van Winden & van den Buuse, 2017). The importance of addressing these issues is reflected by the investments the EU is undertaking. Of the 80 billion Euro dedicated to Horizon 2020, about 18.5 billion Euro flow to solve societal challenges such as energy transformation, resource efficiency, urban transportation, etc. These are some of the issues directly addressed by smart city development.

In the literature concerned with smart city replication the concept of replication is still underdefined and lacks a clear approach (van Winden & van den Buuse, 2017). A review of the literature has made clear that there is a need for a systematic and evidence based approach to promote replication (Caragliu et al., 2011; Fernandez-Anez et al., 2018). This consensus is shared not only in the literature, but also by the EU (Vandevyvere, 2018). Currently urban developers actively focus on solving individual barriers to replication. I propose a new perspective: a systematic approach to help both city developers to passively attract smart city solutions and solution providers to actively seek out fitting urban environments for successful replication. I build this framework on the assumption that a healthy entrepreneurial ecosystem in a city can invite smart city solutions. This idea is based on the established Entrepreneurial Ecosystems framework (Isenberg, 2010). However, smart city solutions seem to require different factors compared to an ecosystem that is focused on entrepreneurship. The area of research analyzing this connection is still in its infancy. One notable exception is Mooji (2020), who finds that support services are especially important.

Within this paper I want to answer the following research question from two perspectives: the smart city entrepreneur and the urban planner. *Can an ecosystem that supports a bottom-up, entrepreneurial-driven approach help to overcome the challenges of smart city replication? If so, which tools can enable analyzing and strengthening such an ecosystem? Are both the entrepreneurs and the urban planners perspective relevant?* By answering these questions two contributions are made. First, a methodological one by developing a framework to assess the strength of a smart city ecosystem. Second, a practical one by analyzing the replication potential of an IRIS demonstrator within the project. We learn that both perspectives are relevant and better understand under what conditions replication of the solution is possible. It has become clear that a policy-driven, subsidized smart city solution is a difficult case for replication. However, within the paper the combination of the EEA and the SC-BMC has shown to add valuable insights about environmental relevance and project-specific factors of a representative smart city solution. Thereby suggesting that both tools are useful in understanding the replication potential of other smart city projects in general.

Consequently, the remainder of the paper is structured as follows: first, I explore why smart city replication is challenging and which solutions are needed to enhance smart city replication. Drawing from this, I suggest that a different perspective is needed, focusing on creating an ecosystem instead of solving individual projects' problems to enhance replication. Second, based on insights from relevant smart city frameworks I adapt the established Entrepreneurial Ecosystems framework. I explain that smart city replication is an entrepreneurial process and suggest that six dimensions must be aligned to enhance it. The dimensions are: community, finance, human capital, policy, support and technology. My framework is then applied in a case study as part of the IRIS Smart Cities Project. The case follows a pilot project in Sweden, which is to be replicated to one of the four follower cities. The goal of the case study is to recommend a target city best suited for replication of the smart city solution. Third, I analyze the possibilities for replication as a proof of concept by comparing the follower cities of IRIS Smart Cities in terms of strength of their ecosystems. Fourth, I conduct a project-specific analysis of the two more promising follower cities, using the SC-BMC. A tool which is based on the popular lean management tool, the Business Model Canvas (Osterwalder & Pigneur, 2010). This allows me to systematically investigate the alignment of a specific project with a city. The canvas highlights project-specific factors that are especially important in the context of this mobility as a service (MaaS) project and reflect on some general success factors of the project. These include supplementary non-car based transportation and related infrastructure, seamless integration into existing solutions, as well as a positive attitude towards slowly transitioning away from car-focused cities by urban planners, solution providers and customers. Fifth, I give a recommendation of how this solution could be integrated into the two follower cities. Finally, I analyze and discuss both frameworks in light of the case study.

Literature Review[1]

Smart city development has been a growing field of research in accordance with the increasing investments and urgency to act on urban planning issues (Cocchia, 2014). This abundant literature is however strongly fragmented (Yigitcanlar et al., 2018). Moreover, the current paradigm, a top-down approach driven by the EU, merits the perspective of an urban developer. Therefore, much of the literature is devoted to (understanding the building blocks of) planning and executing smart city solutions and then measuring the impact, known as benchmarking (Anthopoulos, 2015). Consequently, only a small fraction of the smart city literature is concerned with scaling of existing solutions. The EU, however, has made it clear that replication of smart city solutions is one of their top priorities (van Winden & van den Buuse, 2017) and has published a number of reports on the topic (smarticities-infosystem.eu, n.d.). Still, the academic literature remains scant and the relevance of many publications within the field is still unclear. Furthermore, many of the problems that hold back smart city replication are quite complex problems. Problems such as tacit knowledge transfer, economic efficiency and stakeholder management are problems that are encountered in much of project-based work and can be especially challenging in an international context. This is true for both the private and the public sector (Cooke-Davies, 2002; Ika et al., 2012).

Scaling smart city solutions distinguishes between three different categories (van Winden & van den Buuse, 2017). The first category, roll-out, is concerned with effectively establishing new projects and technologies in the target city. The second category, expansion, covers the process of enlarging an already existing smart city solution. The final category, replication, is further divided into exact and proxy replication. It explains how existing smart city solutions can be replicated across different cities. Exact replication means using a blueprint to replicate solutions. Proxy replication incorporates a certain amount of contextualizing solutions to better fit it to needs specific to a city. The latter is often, at least to some degree, necessary. This contextualization can range from merely translating the manual to a local language to adapting a solution to local conditions and cultural attitudes to the point of hardly being recognizable.

As seen in Table 1[2], in the current top-down environment the EU dictates smart city replication by providing funding and setting long-term regulatory frameworks such as the European Green Deal (Europe.eu, n.d.). However, within the EU there is a challenge of vast differences among cities when it comes to the varying sophistication of the public sector. Some countries are being run in more (cost-) effective ways than others (Afonso et al., 2010). This can lead to a lack of domestic interest and funding due to tensions between regulatory fields (Vandevyvere, 2018), even if most smart city projects are generously supported by the EU (webgate.ec.europe.eu, n.d.). Furthermore, a top-down approach explains the lack of engagement of crucial, local stakeholders. Urban developers can only do so much if local stakeholders, such as governments and citizens are not aligned (Chourabi et al., 2012). Ideally cities would proactively incentivize citizens and entrepreneurs to appreciate and engage in smart city replication (Vandevyvere, 2018), allowing the top-down approach to be complemented by bottom-up initiatives. Citizens

1 To gain an overview of the field research was conducted using Google Scholar. Keywords entered included “smart city” in combination with “replication” or “scaling” and “barriers” or “challenges”. Much of the resulting academic work revolves around case studies or isolated qualitative contributions. Unfortunately, meta analyses or quantitative analyses which could provide a better overview about smart city replication have not been conducted yet.

2 I have compiled the sparse literature into an overview presented in Table 1. Based on the results from the keyword search I have identified some themes within the literature and categorized them accordingly. These categories are labeled as “Challenges”, i.e. a challenge to overcome in order to enable smart city replication. The main sources and a short summary of the challenge follows. The summary consists of two bullet points of what I consider to be the crux of the problem based on a careful review. Then I highlight how the authors, who oftentimes refer to related literature, suggest to overcome the specific challenge. Oftentimes, these are only hypotheses and are not yet established as solutions. If the proposed solution is based on my insights and ideas, I have highlighted them as “conclusions”, which are also just hypotheses.

can be powerful enablers of smart city solutions (Gabrys, 2014; Vanolo, 2016). If local stakeholders are not engaged in smart city planning, many believe that solutions from other cities cannot be rolled out in the same way, even if they have been successful in solving similar problems (Vandevyvere, 2018). This is partly caused by the lack of understanding of the long-term benefits of implementation of said solutions (Hall et al., 2000; Caragliu et al., 2011). Furthermore, the benefits of smart city developments are oftentimes hard to quantify (Dameri, 2013). Addressing problems related to urbanization effectively will require stronger local stakeholder participation, with some speaking of a societal paradigm shift (Gardiner, 2004; Urry, 2015). This might be challenging if not impossible when relying only a top-down approach.

Furthermore, the current process of replication, led by urban developers, is problematic. They might be overwhelmed with choosing a solution to replicate. Replication based on best practices seems to be promising (Bulkeley, 2006; Stead, 2012). Accordingly, established smart city solutions must be benchmarked objectively in order to identify such best practices. However, benchmarking is not easy. There is an oversupply of individual smart city solutions (van Winden & van den Buuse, 2017) and no generally agreed upon approach on how to benchmark them (Anthopoulos et al., 2015). Partly because smart city projects are inherently complex, due to many aspects and interdependencies to consider such as planning, financials, regulation and operation (Falconer & Mitchell, 2012). Consequently, benchmarking requires a lot of data (Bosch et al., 2017). Moreover, best practices must be narrowed down as specifically as possible to fit the local challenge as closely as possible (Angelidou et al., 2018). These conditions might be almost impossible to establish. It might therefore be more feasible for urban planners to create an environment that attracts best practices, shifting the responsibility of selection away from urban planners.

Instead, many smart city projects turn to pilot projects, creating new, greenfield solutions in place of replicating existing ones. The same perspective is even applied in EU lighthouse projects focused on replication. First projects are established in lighthouse cities and then are meant to be replicated follower cities (eu-smartcites.eu, n.d.), where often exact replication is preferred, to satisfy bureaucratic requirements. The downside of this approach is that in many cases pilot projects are isolated from real world competition (van Winden, 2016). When the pilot phase comes to a close financial resources then simply run out and the solution is unable to compete in the real world (Deloitte, 2015). In other words, smart city pilot projects are oftentimes playing out in protected niches, which inhibits gradual change from local to global learning, due to legal or financial overprotection (van Winden et al., 2016). Of course, pilot and explorative projects are not without benefits. They are important tools to test and establish smart city innovations (Liu & Peng, 2013). However, to allow for replication the knowledge from these projects must be made accessible. Knowledge-transfer is oftentimes highlighted as a key factor not only in urban development in general, but also in smart city development specifically (Deakin & Al Waer, 2011; Yigitcanlar et al., 2008). To transfer knowledge successfully, however, urban planners must overcome the inherent “stickiness” of it, i.e. they have to overcome the challenge of transferring tacit knowledge (Capdevila & Zarlenga, 2015). This “stickiness” arises because both projects and related literature focus on specific local issues without taking into account the future replicability of a solution (van Winden & van den Buuse, 2017). Therefore, scalability and replicability must be accounted for in the project at an early stage.

A related insight from management literature (Gupta et al., 2006; Lavie et al., 2010) is the focus of projects on either exploitation or exploration. The main idea is that a project cannot focus on both at the same time, because these activities require different competencies (Gupta et al., 2006). In order to be economically successful, corporations and their projects must balance both activities (Lavie et al., 2010). Arguably, the EU envisions a similar split by focusing on exploration in pilot projects (lighthouse cities) and exploitation (follower cities) but these projects seem unable to achieve successful continued exploitation so far (Boulanger & Nagorny, 2018). It seems that an environment favoring smart city replication should be focused on continued exploitation, reaping the benefits of already established projects. However, urban developers might not be the stakeholders who have the incentives to exploit the existing knowledge for financial gain, this is a role better filled by entrepreneurs. Unfortunately, especially knowledge related to technology advances ever more rapidly forcing urban planners to play catch-up with the latest developments (Liu & Peng, 2013). Consequently, many cities and their urban planners turn to the private sector. This is reflected in the booming sector of management consultancies within Europe, which also covers smart city development (Accenture.com, 27.02.2017.; Cisco.com n.d.; IBM.com, n.d.). This suggests that close collaboration between the public and private sector may have merits in promoting effective smart city replication.

Overall, due to the lack of a guiding framework the process of replication is currently highly inefficient and favors urban developers developing their own solutions rather than replication of established solutions. This means innovations are being developed locally and all too often fail when the pilot phase is over and the funding stops. This prevents the spillovers and innovation diffusion across Europe that the EU is striving for. Instead, I suggest complementing the top-down approach with a bottom-up approach. This would allow for entrepreneurs to add to the current top-down focus on smart city replication. Smart city frameworks have been criticized for not being comprehensive and failing to include underlying relationships among smart city domains (Yigitcanlar et al., 2018). Therefore, we need a systems-based framework to appropriately highlight the interconnectedness of a smart city (solution) (Caragliu et al., 2011; Fernandez-Anez et al., 2018). Furthermore, systematic approaches are widely accepted in sustainability challenges highlighting the interconnectedness of the global ecosystem (Clayton & Radcliffe, 2018; Fiksel, 2006). Similarly in urban development there is a need for the understanding of cities as ecosystems, based on the idea that different participants within the city (e.g. citizens, municipal government, etc.) interact and influence each other (McLoughlin, 1969; Da Silva et al., 2012). It has become clear that most smart city (technology) projects are not only technical, but involve social, cultural, political, institutional, and behavioral changes that are all interconnected. Hence, system innovation might be a solution to enhance smart city replication, focusing on the integration between technological, social, political and economic domains (Elzen et al., 2004; Geels, 2002; Smith et al., 2005). Notably, the EU has also identified the need for a proper guiding framework to apply a systems-perspective, overcoming the fragmentation and singular focus on specific challenges (Vandevyvere, 2018).

Theoretical Framework[3]

A framework that fulfills the needs of a systemic and an entrepreneurial-driven, bottom-up approach is the Entrepreneurial Ecosystem (Isenberg, 2010). It is also relevant in the smart city context, as entrepreneurial activity has long been seen as key to solving the issues of the sustainable transition and knowledge diffusion (Hall et al., 2010; Pacheco et al., 2010; Singh, 2005). Furthermore, smart city development can be driven by local bottom-up incentives (Hollands, 2008, 2015). The goal of an entrepreneur is to create a successful business, based on different motivations it might be purely monetary incentives or include social aspects. However, entrepreneurial activity is not restricted to individuals forming a new business but also includes corporate venturing and intrapreneurship. In short, an entrepreneur is a person that strives to introduce new solutions to existing problems and existing solutions to new problems. In the context of smart city replication this means: if demand for smart city solutions is higher than the supply, entrepreneurs have an incentive to bring these solutions to the market. As entrepreneurs must operate cost-efficiently, they might choose to establish existing smart city solutions. Furthermore, established entrepreneurs might bring their smart city solutions to new cities. In both scenarios, entrepreneurs will achieve smart city replication. Therefore, I suggest that if a healthy entrepreneurial ecosystem around smart city innovation is developed, the city will attract the right entrepreneurs. Thereby effectively shifting the responsibility of choosing and developing the best solutions away from urban developers towards entrepreneurs.

Obviously, the Entrepreneurial Ecosystems framework and the vast array of smart city frameworks are not the same. However, the diverse definitions of smart city seem to boil down to a few essential factors. Therefore, it does make sense to use the factors of general smart city frameworks as guidance of what could successfully increase the chances of replication (Ferrer et al., 2017). To understand the underlying differences, I shortly review six smart city frameworks and the Entrepreneurial Ecosystems framework in Table 2.[4] There are three conclusions that can be drawn. First, smart city frameworks generally have similar building blocks. Second, the Entrepreneurial Ecosystems framework only has a small overlap and the overall objective is clearly different from smart city frameworks. Third, both approaches are based on a systems perspective. They show that that the factors of enabling replication and entrepreneurship respectively are connected. Accordingly, all dimensions of the frameworks must be appropriately developed. In Table 2, only frameworks four and six, both taken from non-academic publications, lack this systematic view.

The smart city benchmarking frameworks in Table 2 all distinguish four broadly defined dimensions: economy, regulation (governance), social and technological (Albino et al., 2015). Based on the context some focus on environmental factors instead of technological factors. As seen in Table 2, these dimensions seem to be present in all six smart city frameworks reviewed, no matter if they are focused specifically on replication or not. Even though, there are oftentimes slight variations in the naming schemes, the definition of the dimensions are ultimately very similar across frameworks. In contrast, the original Entrepreneurial Ecosystems framework has six different dimensions. The whole framework is specifically targeted at policy

3 I establish my framework in four steps. First, I review the building blocks of six representative smart city frameworks and the well-established Entrepreneurial Ecosystems framework. This will enable me to see which dimensions are relevant in both a smart city and entrepreneurial context. Second, I highlight similarities and differences across the six smart city frameworks and link these to the entrepreneurial framework. Third, based on these insights I adapt the Entrepreneurial Ecosystems framework to better fit the smart city context. Fourth, I discuss how this framework can be used to measure the strength of an ecosystem. This will be done by highlighting indicators that best represent each respective dimension of the framework.

4 Frameworks one to three are established, traditional smart city frameworks while frameworks four to six have at least a partial focus on smart city replication specifically. Additionally, I introduce the Entrepreneurial Ecosystems framework in the same format as framework seven.

makers to enable them to improve the ecosystem (Isenberg, 2011). Collectively the six dimensions enable or constrain entrepreneurship in a particular region. Although the dimensions are different, the underlying idea of the framework is relevant in the discussion about smart city replication. It provides a much needed basis for a systematic bottom-up, entrepreneurial-driven approach to smart city replication. This distinguishes it from the smart city (replication) frameworks reviewed, which provide a systemic perspective but still rely on a top-down paradigm. Consequently, the Entrepreneurial Ecosystems framework provides a strong base to be adapted to the smart city context.

I propose an adapted version including six dimensions: Community, finance, human capital, policy, support and technology. The framework is visualized in Figure 1. In Figure 1 we can see that every dimension is based on a summary of the key ideas of achieving smart city replication from a bottom-up perspective. Furthermore, the connection and equal size of the dimensions highlights the underlying idea of a systemic framework, which relies on all dimensions being equally developed to achieve the goal of smart city replication.

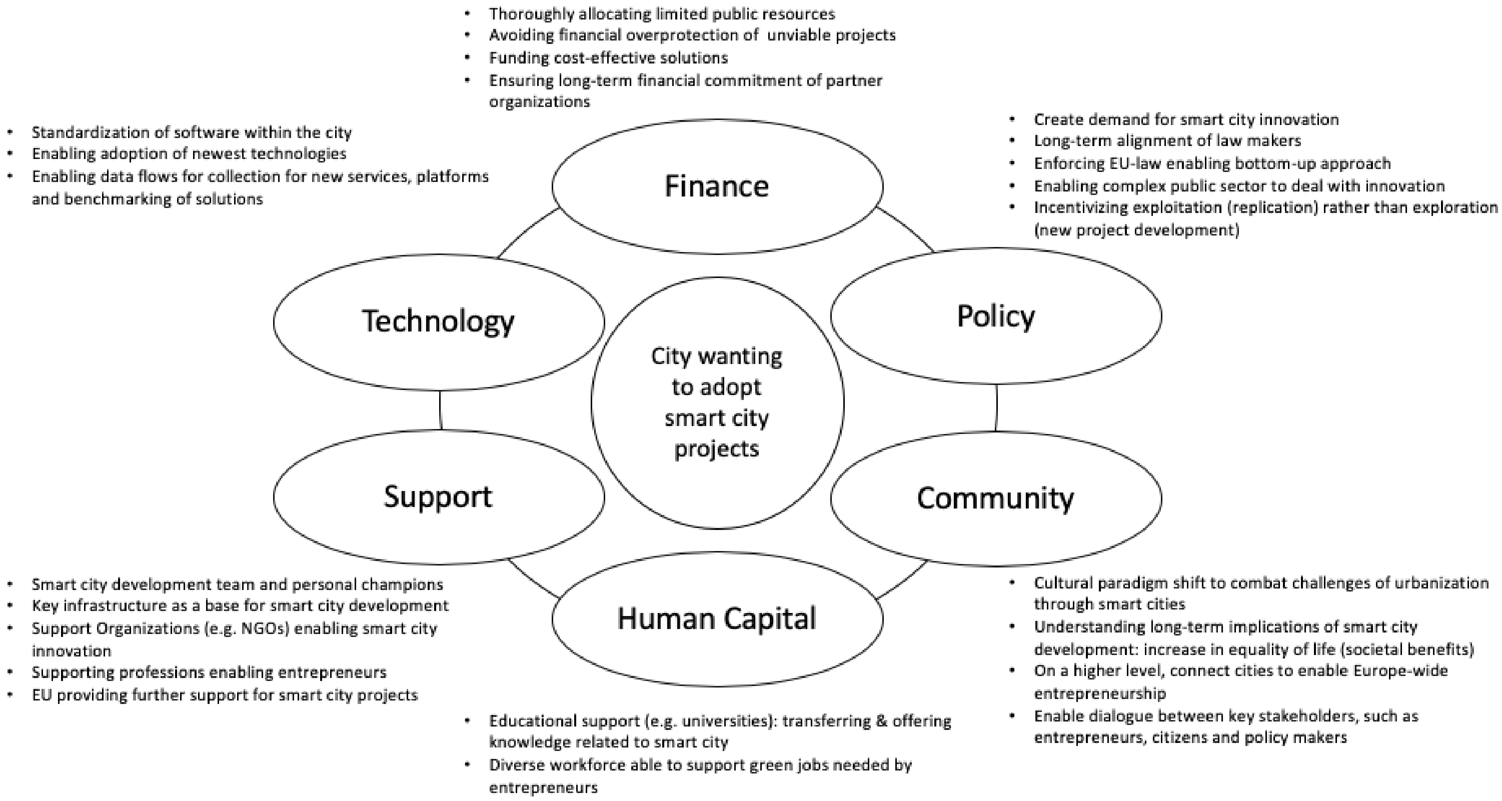

Figure 1 *The Smart city ecosystems framework*

“Community” replaces the more generic “culture” from the original Entrepreneurial Ecosystems framework. “Culture” highlighted the need for success stories of previous entrepreneurial achievements and societal norms (e.g. risk tolerance, societal status of entrepreneurs) to foster entrepreneurship. However, in extensions of the framework authors have already stressed the need for more actively engaging the community into networks via tools like dialogue and events (Stam & Spigel, 2016). In the smart city context, an even stronger focus on community is needed, possibly using similar tools. Specifically, citizens need to be made key stakeholders of the smart city transformation process. This will require a paradigm shift, involving teaching citizens the value of community within their cities and also engaging them politically to work on the big societal problems of urbanization. Many of the problems associated with urbanization are reinforced by an isolated, individual life-style. Citizens oftentimes do not share resources (e.g. not respecting the value of community spaces and goods, buying new items instead of borrowing them within the community, relying on personally-owned transportation, etc.) and are not actively engaged in the process of improving their city. On both a city and country level networks are being formed to enhance the development of smart city projects. This allows not only for knowledge spillovers but also makes it easier for entrepreneurs to cater their smart city innovations to new markets. Ideally this community will be able to increase the demand of smart city innovations provided by entrepreneurs and might also enable citizens to become entrepreneurs/agents of change in their own communities.

"Finance"[5] covers the need for easy access to financial resources (Isenberg, 2010). In the smart city context financial support must also be made available to entrepreneurs wanting to replicate smart city projects. Ideally, both public and private sector money is freely available. However, the private sector oftentimes expects high returns. As many smart city projects are focused on social and sustainability issues, they might not offer the returns needed to qualify for private funding. Smart city projects face the additional challenge that their pay-off horizon might be lengthy and cash flows might be too slow to be a lucrative investment for traditional venture capital. Currently many smart city pilot projects are reliant on public funding and subsidies, especially by the EU. Many publicly funded pilot projects are used to explore new technologies and create knowledge. These learnings must be made accessible to eventually enable new possibilities for scaling and replication. However, this contradicts the philosophy of traditional, private sector funding, which is focused on profiting from knowledge creation and wants the underlying knowledge protected rather than shared. Consequently, traditional financing methods are often not accessible for many smart city innovations (similar to other more socially oriented entrepreneurial efforts). There is a need to explore alternative sources of funding in the future, such as decentralized debt or community-based crowdfunding. This goes beyond the scope of this paper and more research into this topic is needed. But ultimately for a bottom-up approach to succeed alternative funding will be crucial.

"Human Capital" is built around labor and educational institutions in the original Entrepreneurial Ecosystems framework (Isenberg, 2010). Now there is an increased focus on knowledge within the ecosystem (Stam & Spigel, 2016). In the smart city context both factors are highly important. Tacit knowledge transfer is a key factor of success when it comes to smart city replication. Per definition this knowledge cannot be taught but has to come from experience. However, more experience will be gained if educational institutions engage staff and students to participate in smart city development. It is also key to educate future citizens (potential entrepreneurs) about the issues of increasing urbanization. As is the case in the context of Entrepreneurial Ecosystems, a diversity of talent will be key. Likewise, allowing those less educated to participate in smart city developments by focusing on expanding green jobs the economy as a whole is key. These jobs will be needed when entrepreneurs want to scale their business locally. Closely related is the process of attracting human capital. In an increasingly global world where smart city innovation is becoming more

[5] Unfortunately, many smart city projects involve infrastructure developments, which are capital intensive. On the upside, this could engage corporate entrepreneurship and intrapreneurship because their resources are oftentimes less constrained. Financing options must make sure that they provide long-term options and incentives for entrepreneurs and partner organizations too.

important it will be crucial for cities to create an environment where foreign human capital can thrive. Of course, the attitude of the workforce also plays an important role. Workers should care about making an impact by facing social and environmental challenges and contributing to the community.

“Policy” revolves around leadership and government (Isenberg, 2010). The long-term alignment of policy makers will be key to foster smart city replication. They are in charge of creating a regulatory framework favoring smart city-related entrepreneurship (e.g. financial incentives, cutting red tape, etc.). Furthermore, I suggest that policy makers are partly responsible for creating demand for smart city replication. Their objective is to make cities run more efficiently and increase the livability for their citizens, which makes development of smart city solutions almost unavoidable. This will also require policy to align the interests of the public and private sector to encourage smart city innovation being supported by entrepreneurial activity. Leadership will also play a role as we already have the crisis of urbanization on our hands. Leaders will be needed to show that replication is a possible process. Thereby enabling entrepreneurs to look at other smart city developments and copy their solutions.

“Support” consists of infrastructure, support professions and non-government institutions in the Entrepreneurial Ecosystems framework (Isenberg, 2010). I suggest a similar focus for enhancing smart city replication. Smart city projects might involve (the need for expanding) infrastructure. Support must also come from urban developers themselves. They establish champions and teams pushing the agenda of smart city development within the city and support entrepreneurs who are enhancing these developments. NGOs will be especially useful in these contexts because they often push for sustainable development. Establishing connections and networks by spreading their messages globally. Furthermore, entrepreneurs also need to be able to work with locally established companies and gain support from already experienced entrepreneurs (Stam & Spigel, 2016).

“Technology” (replacing markets from the original Entrepreneurial Ecosystem framework) is a key dimension in most smart city projects. It cannot be missing in the smart city context. Therefore, urban developers must enable data availability and relying on open source systems that can be worked with and expanded. This will allow the development of services and platforms that greatly increase the convenience of citizens. Data is also a key in assessing the long-term impact of smart city projects (Bosch et al., 2017). It helps to understand which projects actually contribute to the betterment of a city.

In order for the framework to be of practical significance, it must allow for objective measurements of the dimensions. I suggest using a process similar to the Entrepreneurial Ecosystem Analysis. Entrepreneurial Ecosystems can be best assessed in a holistic diagnosis by measuring the strength of all dimensions within the ecosystem (Stam, 2014, 2018). This approach is necessary as the ecosystem is only as strong as its weakest dimension. To create objective measurements, I focus on the core content of every dimension and then suggest corresponding measurements and potential data sources. The results of this process are displayed in Table 3. As seen in Table 3, I propose measuring indicators regarding both entrepreneurship and smart city (which includes many indicators regarding community, sustainability and technology) in the local area. Gaps can be closed by analyzing if and how previous smart city projects have been successful locally.[6]

Methodology

My framework must be tested to conclude whether it can indeed measure the strength of an ecosystem. Thereby providing an overview of how ready a city is to attract entrepreneurial smart city innovation. This will be done using a representative case study. Case studies are a common method when analyzing new theories and frameworks in international business studies (Ghauri, 2004). In the context of smart city replication, which still lacks a strong theoretical basis, a case study allows me to understand the relevancy of my new framework in the context of a contemporary, EU-spanning smart city project (Rowley, 2002). Hence, showing if it has appropriately identified the dimensions and specific barriers of attracting entrepreneurs to incorporate smart city solutions in the context of IRIS Smart Cities and more broadly, in smart city replication programs.

The case study will cover the Swedish mobility consulting company Trivector, tasked with establishing an integrated mobility as a service (MaaS) solution. Throughout the paper the project will be referenced as project Viva (trivector.se, 2020). Their solution is being piloted in Gothenburg and then will be replicated in one or more of the four follower cities. I aim to provide a recommendation; which ecosystem of the follower cities is best suited for this MaaS solution. This case study was chosen for three reasons: First, it involves new technologies, bringing together different service providers in a private-public partnership. In that sense it is typical for any smart city solution, as more often than not, these involve multiple stakeholders in the public and private sphere. Second, it caters towards citizens as customers directly, after having identified the demand for alternative mobility solutions. Third, it incorporates a strong community focus, as citizens are working directly with the provider learning how to use and improve the service continuously.

However, it is important to highlight that the ecosystem can only in- or decrease the chance of replication. Any individual smart city solution analyzed must provide an answer to the current demands of a city and will need more project-specific factors to be(come) aligned. If there is no demand for a specific solution or the project cannot take off due to a lack of key resources, such as partners, infrastructure, etc., replication of the business model must be pivoted or will fail. Therefore, I must not only answer the question where to replicate but also how to replicate. I.e. which project-specific factors needed to be aligned to ensure successful replication of a given smart city project in a specific city. To measure this fit in a consistent manner across the follower cities I will use the Smart City-Business Model Canvas (SC-BMC) (Giourka et al., 2019). The SC-BMC (see Appendix B) is an adopted version of the popular lean startup template, the Business Model Canvas (BMC). It has a more network-centric perspective, including all stakeholders and their relevancy to the project. Thereby highlighting the value each respective actor(s) contribute to the business model. Furthermore, it integrates smart city specific factors such as environmental and social impacts as well as data flows, etc. Ultimately, the SC-BMC is well suited to present the alignment of a specific project with a city.

6 Unfortunately, some factors might be more difficult to assess objectively than others. It is challenging to measure, for example, the overall interest and participation of the (working) citizens in smart city projects. On the other hand, factors like social and environmental policies are oftentimes internationally compared by organizations such as the OECD or NGOs (e.g. Sustainable Governance Indicators).

Data Collection
To utilize these tools to their full potential general data about the ecosystem is needed as well as specific data from the crucial stakeholder perspectives of project Viva. Therefore, the ecosystem analysis is based on publicly available information. This is in line with the assumption that the access and relevance of public information defines part of the strength of the respective ecosystem. The strength of the six dimensions will be measured using the indicators presented in Table 3. The SC-BMC is based on public information and interviews. Public information was provided online by IRIS Smart Cities and related parties. Gaps were closed by conducting interviews with three key stakeholder perspectives together with a colleague, Britt Kuipers (Kuipers, 2020). Furthermore, a previous academic study focused closely on the tenants perspective of the project (Smith et al., 2018). Overall, all four key actor perspectives are covered in detail.

Results – Ecosystem Analysis[7]

It is clear that there are big differences in the ecosystems between the cities analyzed. Gothenburg offers a very strong ecosystem. A well-educated and community-driven workforce is nudged towards sustainable development by world-leading social and entrepreneurial policies. The population as a whole is also aware of sustainability issues and local policies demand new smart city developments. Furthermore, Sweden in general is familiar with engaging in smart city developments as Stockholm is one of the leading smart cities globally. Similar developments are seen in Finland, as Helsinki is also one of the leading smart cities. However, Vaasa is a much smaller city and does not have the same resources as Gothenburg. Nevertheless, the Finish commitment to carbon-neutrality by 2035 does suggest that the city has an ambitious development plan. Vaasa centers this plan around becoming the Northern European hub for green energy developments, complemented by a city-wide focus and educational focus. In general, we see a strong international outlook from both countries. Their governments clearly focus on attracting international high-skill labor, business and entrepreneurs and provide support systems to do so. A recent movement towards an overarching "Nordic Ecosystem" shows commitment to further improvements (e.g. movetonordics.com; #nordicmade), making it even more attractive for (international) entrepreneurs. Indeed, the Nordic European states offer some of the best entrepreneurial ecosystems for smart city development globally.

Consequently, other cities do not offer the same strong ecosystem. Santa Cruz de Tenerife is an interesting case. Spain seems to be greening its economy actively and has overall decent indicators for social and environmental developments. However, the Canary Islands are very isolated and offer a separate ecosystem. Much of the local economy is still focused around tourism (however the current tourism shock might stimulate quick changes), but there is also an international community engaging in entrepreneurship. More research is needed how much of this entrepreneurship relates to bottom-up smart city initiatives. Overall it seems like the ecosystem is held back by access to international finance and lack of integration into the European markets in general. On the bright side, there are ambitious plans to develop Santa Cruz de Tenerife into a more integrated innovation hub.

7 Detailed results are presented in Tables 4-6 in Appendix A. The tables condense the relevant indicators for each dimension (as introduced in Table 3), along with city-specific local information (as far as available) to give an initial impression of the strength of the respective ecosystem. Information is structured along the six dimensions of the framework. Sources within the tables are provided in a separate document.

Romania and Greece offer different economic outlooks and boast much weaker ecosystems in all aspects. Romania seems to be improving and integrating its economy into the European markets quickly, while also trying to improve the entrepreneurial ecosystem. However, social and environmental policies are lacking, and educational opportunities are centered around urban hubs. The town of Focsani has a local economy still centered around very low-skilled, non-digitalized activities such as agriculture. Consequently, infrastructure to encourage local entrepreneurship seems to be largely absent. There is also no international outlook trying to attract European entrepreneurs. The population is quite uniform, and the city currently does not seem to be struggling with urbanization as it lost almost 25% of its inhabitants between 2002 and 2011. In this case smart city transition seems to be needed as tool to stay competitive with other Romanian urban centers, avoiding further depopulation.

Alexandroupoli similarly seems to be focused inwards with a highly uniform population. Hence, touristic outlook is valued over trying to attract any entrepreneurial business. The city has a better history of smart city innovation, winning a national competition in 2019. The network of the city is also better developed than Focsani's as Greek cities are looking towards joint smart city innovation. However, social and developmental policies are among the poorest in Europe. Furthermore, there seems to be no entrepreneurial support infrastructure as all Greek entrepreneurship is centered in Athens.

Of course, it is important to highlight that the ambitions of these cities, working together in a Europe-wide collaborative project, will be important for future perspectives and developments of smart city replication across Europe. But from the perspective of an European entrepreneur looking to replicate his smart city solution there is a clear difference in the level of development of the ecosystems. Although the ecosystem pre-analysis does not cover all the aspects originally considered in the framework, as some information is unavailable or only accessible via additional research methods, I am confident to exclude two ecosystems based on the factors discussed. Both Alexandroupoli and Focsani offer lackluster ecosystems for smart city replication. Santa Cruz de Tenerife does not seem as developed as Vaasa in many aspects, but it still seems to boast a stronger ecosystem, compared to its Greek and Romanian counterparts.

In context of replicating a MaaS solution further factors must be considered.[8] The solution is particularly relevant to cities dealing with issues such as crowding of infrastructure, congestion and air pollution. Consequently, cities experiencing depopulation and thinning of urban density do not have a strong need for MaaS solutions. Furthermore, the expected benefits will be much lower in such circumstances. In my opinion two cities are better suited for a MaaS solution: Santa Cruz de Tenerife is struggling with a dense urban center, especially during tourist season as well as limited options for future expansion of the city. Vaasa is relevant because of the close similarity with the Gothenburg ecosystem at the outset, which would allow for easier implantation. After understanding which ecosystems are preferable, I turn to analyzing the project-specific factors necessary for replication.

8 Mobility as a service (MaaS) describes the shift towards mobility via service providers, away from personally-owned modes of transport. The goal of MaaS is to improve transit network efficiency. In the smart city context this provides a number of benefits, such as reduced congestion, improved air quality, less traffic accidents, lower costs for end users and higher space efficiency for walkways, parks, etc. as less infrastructure for cars is necessary. Thereby allowing urban planners to shift from focusing their city around cars and towards greener, more pedestrian friendly cities. The most successful MaaS solutions offer interconnected services. A single service provider offers an integration of all local MaaS offerings, such as the Whim App in Helsinki (whimapp.com, n.d.). Interconnected MaaS solutions are still in their infancy and are challenging to implement as they need to align public transportation, costumers and private businesses in one service. However, the Ubigo trial showcased that a well thought out solution leads to a deregistration of cars and is highly popular locally, boasting an overall approval rate of 97% (Goodall et al., 2017).

Results – Case-Specific Analysis[9]

Context

Gothenburg aims to reduce reliance of its citizens on personally owned cars for transportation. Therefore, the city introduced a set of corresponding policies disincentivizing car ownership as car usage rates are low throughout the municipality (YouTube.com, 01.04.2020). Property developers are economically incentivized to offer alternatives to parking garages. Specifically, property developers are able to offer less parking space per tenant (dependent on the location and size of the development) the more alternative mobility offerings are provided. Developers are able to save money by forgoing building a full-size parking garage. However, they generally lack expertise in mobility solutions and therefore engage in partnerships with mobility consultants, such as Trivector. Trivector's offering caters fully integrated mobility solutions towards property developers. In turn, they profit from quickly gaining green lights by the municipality for new developments as Trivector is a reputable partner (Kuipers, 2020). The policy is an interesting example as it does not outlaw car ownership but rather tries to create more lucrative alternatives. Other cities with growing populations or similar ambitions to reduce car-ownership should be closely watching as they might be interested in implementing similar policies. In project Viva no parking space was provided within the development which includes 132 apartments. Instead the development offers shared e-bikes, (e-)cargo bikes, electric cars and other small electric vehicles and charging infrastructure as well as bike parking and a bike workshop for the (prospective) tenants. Overall 18% of the tenants still own cars, but it is a first step in a process in which urban centers need to evaluate if cars are a sustainable transportation mode for the future. The project is part of a smart city pilot with the ambition to create a strong, local community (smartcitysweden.com, n.d.). Trivector also contributes to the local community. They engage residents of the property into collaboration by using both group and personal meetings. This seems to be a solid strategy as tenants engage with the solution more often if they have been living in the building for longer (Smith et al., 2018).

Overall, the business model is very interesting but due to policy-dependence it relies on not a good example of an easily replicable MaaS solution. In this business model most of the costs are covered by the property developer rather than passed onto the end-users. However, in the future the revenue structure of the project might change. The initial costs associated with the project are setting up local infrastructure for software (e.g. application for tenants, back-end interaction of different vehicles with the application) and hardware (e.g. rental (e-)car and (e)-bike parking and charging). Furthermore, constant maintenance of both hardware and software are required. This can be costly as the vehicles are used a lot. However, customers are guaranteed as people moving into these developments surrender having a personally owned car in close proximity. In fact, some of the tenants who do own cars have expressed their discontent of having to walk long distances to access it (Kuipers, 2020). However, this is a minority of the tenants. For all other tenants the business model is more appealing. They pay about market price for the apartment but are able to access electric (cargo) bicycles for free.[10] Cars can be accessed rented next to the building for a usage-based fee.

Unfortunately, the economic viability of project Viva is unclear as it was subsidized by the EU. The EU assumed the costs that are usually covered by the property developers according to the underlying policy. I.e. in this pilot project the long-term economic viability of the business model was not a concern. Within this paper a close evaluation of the subsidy and analysis of

[9] The results are summarized in a filled-out SC-BMC (see Appendix C). The completed canvas allows for an in-depth understanding of the project. Sources are listed after the canvas.

[10] There are further innovations being piloted in the apartment complex, which makes a direct comparison of market prices challenging.

the long-term financial soundness was not possible. Financial information was not available and the interview partners were not in a position to provide this information. Such data should be made publicly available by the EU. Ideally, this transparency would be required to gain access to funding for the project. For now, many important questions about the economic replicability of the project are unclear. However, analyzing project Viva provides us with a few insights about success factors for MaaS solutions in a general.

First, MaaS solutions are highly reliant on supplementary transportation methods. If cities want to increase feasibility of similar solutions, public transportation and infrastructure for widespread use of more flexible transportation methods, such as bikes, must be accessible. Therefore, infrastructure (investments) are a success factor. Complementing public transport with MaaS services and vice-versa gives users a seamless transportation experience. The municipality might also profit as public transportation usage rises with decreasing reliance on cars throughout the city.

Second, it will be crucial to combine these offerings into one platform to give users the ability to seamlessly switch between modes of transportation. This broad array of MaaS services will ultimately enable citizens to feel confident about giving up their car, as alternatives to fit personal preferences and needs are available. Therefore, if solutions like project Viva are economically viable it might be very much in the city's interest to scale the platform quickly. A city-wide platform will then encourage other MaaS providers to strive for integration. This in turn grants integrated service providers access to a city-wide market. However, the devil lies in the details. Previous interviews of tenants have shown that a poor platform design or missing functionalities are among the strongest barriers to using the service (Smith et al., 2018). For example, Project Viva is the first third-party application that has been integrated into public transportation in Gothenburg. Unfortunately, this integration does not allow for the purchase of discounted tickets, such as long-term subscriptions, within the application. Consequently, this integration is unused after a period of initial discounts to engage the tenants (YouTube.com, 2020). There are further challenges to integration. As seen in the SC-BMC, the pilot project involves a lot of stakeholders for being a relatively small, local project. There are not only key stakeholders but also key suppliers, including technology providers and fleet providers. This might be convenient for the service providers who can outsource liability. For example, maintenance of the vehicles is covered by the fleet providers. However, from an integration standpoint this is inefficient. This small pilot is already struggling with alignment in one platform (Kuipers, 2020). Furthermore, there is the issue of payment and pricing. The more flexibility in the payment options the better for the end user. Typical are pay-as-you-go and subscription models. However, with the increasing integration of service providers, subscription prices can quickly skyrocket.

Third, MaaS solutions experience network effects. This pilot project might just be the starting point of a network effect based on more MaaS offerings across Gothenburg. Network effects describe the increase in end user utility based on an increase of users on a given platform. With MaaS this is certainly true, as bigger networks mean more vehicles available at more pick-up and drop-off points, and therefore more flexibility. This does not necessarily mean that there cannot be different solutions between one development to the next, as local tenants do actually prefer different types of vehicles (e.g. larger cars with more cargo space versus smaller city-focused cars) (Kuipers, 2020). Encouraging competition will be a key to make sure all user needs are satisfied.

Recommendations

I have shown that both environmental as well as project-specific factors play a role in enabling replication of this MaaS solution. Consequently, I need to highlight both perspectives when recommending where and how to replicate. This interaction is visualized in Figure 2. This 2x2 matrix shows that a smart city project relies on specific, crucially important factors and can benefit from additional, “nice to have” factors. Furthermore, the environment for replication has factors that are either easy or hard to change. The overlap of hard to change, environmental factors and crucially important, project-specific factors are what can be considered the prerequisites of replication. Factors that are crucially important and easy to change can be improved by both the entrepreneur and the urban developer to enhance the city-solution fit. Factors that are “nice to have” and easy to change can be improved if resources are available. Finally, “nice to have” and hard to change factors can be safely ignored.

The Environment

The Project	**Easy to Change**	**Hard to Change**
Crucially Important	Local fleet providers with diverse offerings (cars, e-cars, bikes, etc.) Policy-base to encourage demand Property developers willing to take a risk Attitude of customer base Skilled local workforce Patience with customers slowly transitioning	An economically sustainable business model Supplementary public transportation Cultural attitude towards and infrastructure for biking Trusting relationship between property developers, solution provider (mobility consultant) and municipality
Nice to Have	Flawless integration into existing platforms Local transportation data and studies Mobility coaching and engaging customers Feedback loops by customers (citizen engagement)	Political will to overhaul transportation Central location / close proximity to public transportation Little local competition Property developers are interested in social and environmental aspects

Figure 2 *Environmental and Project-Specific Success Factors*

As seen in Figure 2, the analyses have allowed me to compile the most relevant factors into the matrix. Two crucial aspects to keep in mind are that the smart city solution in the case study is policy-dependent and subsidized. These factors are a crucial barrier to smooth replication. The underlying policy may be (closely) replicated easily. However, the first step to enable replication must be ensuring long-term financial sustainability, which could be challenging. Especially, because this business model is built on the strong relationship between stakeholders. Furthermore, this particular business model relies heavily on the usage of bikes. A mode of transportation that is more popular in Northern Europe. Even if adjustments of vehicles can be made to fit the local infrastructure and (cultural) preferences, it is unclear what the ramifications for the business model are. Additionally, it is debatable how important fleet providers are to support the business model or if the solution provider could provide vehicles themselves.

Vaasa has a decent fit for replication. The overall ecosystem is similar, providing both supplementary public transportation and infrastructure as well as regular usage of bikes by the citizens. There are strong ambitions to reduce both emissions from transportation and car-ownership in general. This makes similar demand-creating policies likely. Furthermore, MaaS has been established as a successful business model in Finland (medium.com, 2019; whimapp.com, 2019). The local battery technology hub ensures a relevant workforce and might mean that people are more interested in such innovative solutions. This might be the case as e-vehicle innovation and battery technology are closely related. There is a possibility of software-integration along the services of the Waalti card, the local public transportation card. However, because the city is so small and 81% of the population lives within biking distance of their daily commute, specifically targeting citizens might be challenging (vaasa.fi, 2019). It might be possible to integrate a solution along the new battery technology park, just outside the city (energyvaasa.fi, n.d.). It is currently under construction and there are ambitions to flawlessly connect it with the local business cluster in the west as well as the university and city center in the north (gigavaasa.fi, n.d.). Consequently, (inter)national business activity will increase in the coming years in Vaasa, most of which will be in need of flexible, short-term mobility solutions.

Santa Cruz de Tenerife provides more challenges. Even though there is public transportation along bus routes and trams in the city, car usage is still wide-spread (gobiernodecanarias.org, n.d.). The island is very touristic and therefore many rental cars and taxis are also on the road, which are an important part of the local economy. Unfortunately, it is a challenging environment for bikes, especially in the city center. Documents of the city government suggest that the current attitude of cars and pedestrians towards biking in the city makes the activity too dangerous to promote without expanding bike infrastructure first (santacruzdetenerife.es, n.d.). The city has far-reaching plans to restructure the transportation across the whole island (tenerife.es, n.d.). Policy-wise it is a good time to think about MaaS solutions, as the island wants to disincentivize car usage, switching more users to public transport. Furthermore, the island has much potential to restructure mobility around more sustainable solutions. There are both excellent sun and wind resources for renewable electricity production that would need to be buffered in (vehicle) batteries and it would make sense to try and promote vehicle electrification in the large rental and taxi fleet catering to more sustainable tourism. A close examination of business opportunities would involve research beyond the scope of this paper. In this case it would be important to involve local mobility experts to better understand demands of local citizens as well as shortcomings of the current supplementary public transportation network.

Discussion and Conclusion

The aim of this paper was to highlight the possibility of enabling smart city replication through a bottom-up approach driven by entrepreneurs. Thereby complementing the current top-down paradigm. This was done by both providing and applying a new framework to measure the readiness of a city to adopt smart city solutions, answering the question *where to replicate?* from an entrepreneurs' perspective. However, such a perspective is missing project-specific success factors, which are of course key to successful replication. This was solved by using the SC-BMC, which has helped to answer the question *how to replicate?*. In this paper I have conducted one of the first trials of the real-world applicability of these tools, while also analyzing them on a more fundamental level. There are methodological as well as practical implications to be discussed.

Methodological

It has become clear that both tools and their corresponding perspectives add valuable insights to recommending a target city for replication. Even though, the SC-BMC was not built to enable smart city replication as its primary objective, the case study has showcased that it can be used to analyze the key success factors of existing smart city projects. By carefully dissecting all parts of the project, insights about replication possibilities can be gained. This is only possible if it is clear which local circumstances helped the project to be successful. Hence, to a certain extent the reader will understand which factors need to be aligned if the project is to be replicated elsewhere successfully. However, the tool by itself fails to asses some environmental factors for replication such as local competition, and funding opportunities. The case study has also unveiled some problems with the tool. In clear contrast to the original canvas, which was designed as a lean tool, the SC-BMC is a time-consuming tool to work with. The in-depth nature of the questions and multiple perspectives of the canvas delivers detailed but partly redundant results. Furthermore, not all parts of the canvas seem to be relevant for an in-depth understanding of the project. However, the EEA is also far from perfect. When analyzing cities, project-specific factors such as public transport, bike versus car infrastructure and the viability of the business model itself are important factors to consider when aiming to replicate a MaaS solution from an entrepreneurs' perspective. These factors are, however, ignored when conducting an ecosystem analysis using the EEA. Ultimately, neither of the two tools should be relied on by themselves for addressing the smart city replication potential of a project.

Practical

Also from a practical perspective both tools have shown their different foci. The case study has showcased how the SC-BMC is in fact a nice tool for the entrepreneur (Trivector) to better understand how to adapt the solution to a target city (Vaasa and Santa Cruz de Tenerife) when thinking about replication. On the other hand, the EEA has helped to unveil some of the key weak points of the follower cities of IRIS Smart Cities, especially Focsani and Alexandroupoli. These weak points include funding opportunities, policy foundations and entrepreneurial infrastructure. From an urban planners' perspective an ecosystem analysis will be useful to continue improving the city along the dimensions of enabling replication of a broad set of smart city solutions. The goal of the urban planner should be to continuously work on the weak points of the ecosystem.

The case study has also shown some underlying problems of funding smart city pilots by public means. In the case study the long-term economic viability was not a concern, even though the project is meant to be replicated. Such liberal subsidies can of course not be a long-term solution to incentivize a bottom-up, entrepreneurial-driven ecosystem. Furthermore, they encourage unfinished business models. Both the service itself and the underlying business model are not fully developed. For example, fleet providers do not pay for integration even though the gain access to a broader marketer. The service itself has been criticized by both the customers and the end users, to a point where the property developer would not have paid for the solution in its current form (Kuipers, 2020). Under such circumstances (smooth) replication from lighthouse to follower city should not be expected.

Conclusion

After closely analyzing smart city replication it is clear that it is not an easy feat to take smart city innovations from one city to the next. As the case study shows, smart city projects involve many aspects that are localized. The circumstances for a similar project might be very different within the same country and even more so when crossing borders. Yet, the EU continues its focus on expanding smart city innovation across Europe. Still, a supplementary bottom-up approach would be desirable. Such a movement would complement a more social and sustainable focus on local entrepreneurship nicely. However, there are big hurdles to overcome. It is clear that a policy-driven, possibly financially unsustainable business model would not make for an easily replicated smart city solution. But, such pilots are valuable. It has also become clear that smart city innovations like project Viva are not an instant success. However, by engaging and teaching stakeholders about innovative pilot projects like Viva, they will hopefully gain more widespread use and attention. This pilot might allow for a future iteration of the business model ready for easy replication: a finished product with an underlying long-term sustainable business model.

Future research will need to look at the possibility of a bottom-up smart city approach and decide if entrepreneurs can indeed complement the top-down drive to improve cities. Furthermore, the value added of the smart city ecosystems framework has yet to be determined. Within IRIS Smart Cities it would be an interesting opportunity to discuss with urban developers if the ecosystem analysis has added any value to their perception of their city. In any case more questions arise about the underlying ideas, the general applicability as well as future iterations and the worth of pursuing such a perspective.

Limitations

The biggest limitation of the paper is that the nature of the assumptions of the framework cannot be tested in a single case study. In order to gain the most insight from the ecosystem analysis the process needs to be iterative. Results must be taken to urban planners, improved upon and then reevaluated. Thereby showing if meaningful improvements in the number of smart city innovations by entrepreneurs are happening. This case study has shown that the framework is applicable in theory, however not if it is useful in the long-term improvement of urban ecosystems. Furthermore, some indicators were harder to measure than anticipated, such as the demand and supply of green jobs. Another problem is that some indicators used to measure the strength of the ecosystem provide important insights of a country's development and readiness for adopting smart city solutions. However, they are collected on a per-country basis it is not clear how they reflect the ecosystem on a city-level. In my case study it has become clear that there are stark differences between smart city development in the same country. To overcome these limitations it would be ideal if a centralized body such as the EU could provide summarize data of indicators closely related not only to smart city but also sustainable development not only on a country-, but also on a city-level. This could benefit future research into (smart) city development immensely.

Another limitation was conducting the case study relying on (mostly) publicly available resources in English. This was challenging during the ecosystem analysis, especially when looking at smaller towns in Greece and Romania. Unfortunately, when evaluating local entrepreneurship this might induce bias as sometimes little information is available in English. Especially local bottom-up incentives might not be salient, leading to an underestimation of the strength of the ecosystem. However, this approach does make sense if we assume that international outlook and attracting international entrepreneurs is also an indicator of the strength of the ecosystem. A closer assessment of the ecosystem would require interviews of experts with in-depth understanding of local urban development and smart city experience. It remains unclear if the ecosystems of the follower cities have been fundamentally misjudged. Based on my research, I do not think that is likely. However, a more in-depth review would lead to better insights for urban planners to (further) improve the ecosystems of their cities.

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Figures

Figure 1 – The Smart city ecosystems framework
Source: Self-made

Figure 2 – Environmental and Project-Specific Success Factors
Source: Self-made

Appendix A – Tables

Table 1 – Summarizing challenges and proposed solutions to smart city replication
Source: Self-made

Table 2 – Summarizing six representative frameworks of smart city development and the Entrepreneurial ecosystems framework
Source: Self-made

Table 3 – Testing the validity of the smart city ecosystems framework
Source: Self-made (detailed references are found in a separate document attached to the paper)

Table 4 – The smart city ecosystem of Gothenburg and Vaasa
Source: Self-made (detailed references are found in a separate document attached to the paper)

Table 5 – The smart city ecosystem of Alexandroupoli and Santa Cruz de Tenerife
Source: Self-made (detailed references are found in a separate document attached to the paper)

Table 6 – The smart city ecosystem of Focsani
Source: Self-made (detailed references are found in a separate document attached to the paper)

Table 1 *Summarizing challenges and proposed solutions to smart city replication*

Challenge	Main Sources	Summary	Proposed Solutions
A top-down approach: *Political alignment and regulatory issues*	Chourabi et al., 2012; Vandevyvere, 2018	The EU has guiding laws on sustainability issues, but implementation is dependent on current political alignment of member states. Tensions between different government bodies due to conflicts about funding priorities.	EU-level changes are needed: Incentivizing member states to adopt sustainable regulation more quickly, for example by conditional funding. Paradigm shift towards sustainable projects as long-term cost savings rather than investment.
Consequences of the top-down approach: *Local stakeholders, especially citizens, are not engaged*	Caragliu et al., 2011; Hall et al., 2000; Gabrys, 2014; Vanolo, 2016	Politicians and businesses think and plan short-term, while smart city projects usually are long-term projects. The benefits of smart city solutions are unclear for key stakeholders, especially citizens, which are therefore not engaged in the process of urban development.	Incentivize long-term planning in the city. Engage citizens as long-term stakeholders. Enable a paradigm shift towards sustainability in all aspects of urban life.
Unrealistic expectations for the replication process: *Best practice and successful benchmarking*	Anthopoulos et al., 2015; Bulkeley, 2006; Falconer & Mitchell, 2012	Smart city solutions are plentiful but it is hard to objectively measure their impact/success. Urban developers struggle to establish a replication routine based on best practices.	Agree on a framework and objective measurements. Conclusion: Enable an environment where best practices are not selected by urban planners, but rather passively adopted by entrepreneurial activity.
Consequences of unrealistic expectations for the replication process: *New, overly protected pilot projects*	van Winden, 2016; van Winden et al., 2016; van Winden & van den Buuse, 2017	Replication is overwhelming, instead urban planners turn to new pilot projects. Pilots are being used to test new smart city ideas but are not economically feasible. Support dies after pilot ends.	Incentivize long-term feasibility, by focusing on scaling and replication opportunities early in the project. Choosing the right partners (public & private) that enable long-term betterment of the city.
Enabling smart city replication: *Transferring knowledge and exploiting it*	Capdevila & Zarlenga, 2015; Deakin & Al Waer, 2011; Yigitcanlar et al., 2008	Knowledge of smart city development is considered sticky. Smart city projects focus on being explorative, rather than exploitative.	Enabling learning from the replication process. Focus on exploitation (= replication) of existing knowledge from the beginning. Allowing for public-private partnerships to help build smart city solutions.
Enabling smart city replication: *Connecting cities through networks and standardization*	Hashem et al., 2016; Komninos et al., 2013; Mehmood et al., 2017	Cities use custom solutions, increasing costs of replication. This is especially problematic when in a technology context, when proprietary software is used.	Collaboration between cities to foster knowledge transfer through standardization, ideally EU-wide. Use of open source tools.
Systematic problem: *Focus on individual problems rather than providing ecosystem, where replication can happen*	Caragliu et al., 2011; Fernandez-Anez et al., 2018; Vandevyvere, 2018	Urban developers focus on solving issues themselves rather than creating an ecosystem to support replication. No established framework means the process stays vague and expensive.	Establish appropriate framework to engage in replication process. Conclusion: Create an ecosystem to support passive smart city replication. Enable entrepreneurial activity by stakeholders who can profit from smart city developments.

Table 2 *Summarizing six representative frameworks of smart city development and the Entrepreneurial ecosystems framework*

Framework	Relevance and Source	Objective	Dimensions	Use Case
(1) Smart City Wheel	One of the most established frameworks (Yigitcanlar et al., 2018). Originally developed by an urban strategist (Boyd Cohen, 2013) and expanded by the European Policy Department (Manville et al., 2014).	Establish objective KPI's to benchmark smart city solutions. Move smart city projects beyond technology realm.	Cities, economy, environment, government, mobility, living and people.	Smart city-ranking within the EU, based on a collaborative project of multiple European universities. (smart-cities.eu, n.d.)
(2) Smart City Initiatives	One of the most influential academic contributions in smart city framework literature by (Chourabi et al., 2012).	Identify critical factors for smart city development. Highlight the importance of the interconnectedness of dimensions within (smart) city development.	Inner: organization, policy and technology. Outer: communities (people), economy, environment, infrastructure and governance.	Established an essential building block for academic literature concerned with finding a common definition of smart city frameworks.
(3) A Multidimensional Smart City Framework	Framework based on a comprehensive meta study reviewing 78 peer-reviewed papers and 20 smart city frameworks (Yigitcanlar et al., 2018).	Help understand and solve the complexity of smart city development. Focus on outcomes to address social-spatial inequalities.	Drivers: community, policy and technology. Outcomes: economy, environment, governance and society.	Analyzed a broad range of literature according to the dimensions introduced to reinforce their importance.
(4) CITYkeys	Established by (Bosch et al., 2017) in the context of an EU report. Summarizing indicators 43 existing smart city frameworks.	Establish objective KPIs to enable standardization, which leads to higher chances of replication.	People, planet, prosperity, governance and propagation.	Established 99 project and 76 city indicators. Supported lighthouse projects within the EU.
(5) Urban Regeneration Model (URM)	Developed in the context of an EU project with a focus on replicability (remourban.eu, n.d.).	Methodological guide to improve quality of life of citizens based on citizen engagement. Focus on replicability potential.	People and social characteristics, governance, sustainable and smart city strategies, finance, energy, mobility and ICTs.	Used within the REMOURBAN EU project (2015-2020), including replication from three lighthouse cities to two follower cities.
(6) Dimensions of Replicability	Report commissioned by the EU analyzing 300 smart city solutions (Chourabi et al., 2012).	Understand success factors of smart city development. Find common characteristics to benchmark best practices.	Technological, socio-cultural, political-institutional, and economical ("business factors").	Tested in depth on ten integrated smart city solutions, analyzing their roll-out potential.
(7) Entrepreneurial Ecosystem (Classical Framework)	Established framework (Alvedalen & Boschma, 2017) by (Isenberg, 2010). Expanded continuously.	Develop an ecosystem that fosters local entrepreneurship. Highlight importance of connected dimensions within the ecosystem.	Policy, finance, culture, support, human capital and markets.	Aimed directly at entrepreneurs and policy makers, globally shifting attention towards entrepreneurial policies (Stam & Spigel, 2016).

Table 3 *Testing the validity of the smart city ecosystems framework*

Dimension	Content of the Dimension	Measurements	Potential Data Sources
Community	Citizens care about sustainability and therefore demand smart city solutions. Citizen participation is an important factor in improving smart city solutions. City-wide networks help establish smart city connections.	Perception of sustainability and environmental awareness of local citizens. Participation and success of existing smart city initiatives (focus on "citizens first"?). Connection to country-/EU-wide smart city initiatives.	Sustainability Index, Sustainable Brand Index, etc. Record of previous smart city initiatives and their community involvement; Existence and success of local of bottom-up initiatives. Country-/EU-wide smart city initiatives and projects.
Finance	Private and public sources finically support smart-city solutions and care about the long-term economic viability. Long-term partnerships are favored to scale successful smart city solutions. Funding is available through a transparent process.	Financial support for relevant projects (consistent and unbureaucratic). Economic sustainability of existing smart city projects. Entrepreneurial financial support tied to local environmental and social benefits.	Global Entrepreneurship Monitor, local statistics on entrepreneurship and entrepreneurial funding (focus on sustainable and social entrepreneurship). Prevalence of green bonds and similar financial initiatives.
Human Capital	A diverse workforce is adequately educated to work on smart city projects, involving both low- and high-skill jobs. The workforce is generally interested in improving the city by working on smart city solutions. Educational institutions are involved to enable knowledge transfer and teach about the importance of smart city solutions.	Growing supply and demand for green jobs/certified green companies. Government support for retraining from "dirty jobs". Educational obtainment and focus on sustainability in education. Government support for educating about smart city issues and solutions. International outlook of the city towards human capital.	Statics about the job market (green versus "dirty jobs"), certified green companies. Local universities/educational institutions, statistics about educational obtainment and focus/content of studies, smart city projects with university collaboration Government incentives to attract international workforce; Smart city viewings.
Policy	Policy makers create demand for smart city solutions by focusing on increasing quality of life for their citizens. Policy makers offer support for entrepreneurs working on smart city solutions. The government enables public-private corporations to enhance their city.	Policy-commitment to social and sustainability issues. Policies, involvement and attitudes towards smart city development. Centralized process for enabling private-public partnerships.	Sustainable Governance Indicators; OECD Policy Assessments; Self-reported progress on Sustainable Development Goals (7, 9, 11, 12, 13). Record and policy initiatives concerning smart city projects.
Support	Infrastructure is available to make smart city solutions feasible. Support networks for entrepreneurs are available to encourage smart city developments. NGOs encourage stakeholders to focus on sustainable smart city solutions.	Existing and future infrastructure projects (e.g. public transport, electric car charging, etc.). Networks supporting entrepreneurs with special focus on local social and environmental focus. Support and monitoring of existing projects by the local government, access to these resources. Prevalence and popularity of NGOs.	Local statistics about smart city infrastructure (e.g. access and use of public transport). Entrepreneurial infrastructure (incubators; science parks, etc. and their research intensity for smart city). NGO rankings (e.g. ngoadvisior). Accessibility of support networks for smart city initiatives.
Technology	The city encourages new technology development. Projects have access to be integrated into existing software systems within the city. The city is able to provide necessary data and encourages city-wide dataflows.	Technological progress and e-government initiatives. Attitude towards technology and technological compatibility in smart city projects. Information and data (quality) provided by the government about the city.	Indexes for technological advancements and innovation. Record of smart city projects and technological advancements in the city. Local government websites, e-governance rankings.

Table 4 *The smart city ecosystem of Gothenburg and Vaasa*

Dimension	Gothenburg, Sweden	Vaasa, Finland
Community	Sweden is known for its strong focus on citizen welfare and has its economy centered around this paradigm (WHR Rank 7; EPI Rank 5; GCI Rank 4; SPI Rank 5).[1,2,3,4] Gothenburg specifically has been dubbed "greenest city on earth" and won consecutive prices for most sustainable destination from 2016-2019.[5,6] The city has a clear concept and vision for future development and case studies show an overall strong smart city development process.[7] The city uses ITT to inform and stimulate citizen involvement and enable a collaborative city development process.[8,24] The population has high ecological awareness and focus on sustainable consumption and resource management.[9]	Finland is known for its strong focus on citizen welfare and has its economy centered around this paradigm (WER Rank 1; EPI Ranking 10; GCI 1; SPI Rank 4).[1,2,3,4] Vaasa has a strong focus on green energy development and has an educational strategy starting at kindergarten level to match it.[35] We see high ecological awareness and focus on sustainable consumption and resource management.[9,36]
Finance	Overall financial support seems slightly above European average, VC is lacking especially for women.[10] There is increasing support for social entrepreneurship and clean-tech solutions.[10] Gothenburg is working on improving support for (social) entrepreneurship.[11]	Finland has a poor history of entrepreneurial finance. However, things are improving.[37,38] The Finish government is improving financial support and ecosystems for entrepreneurs and existing businesses.[39] In Vaasa, there are some local incubators further research is needed on access to (inter)national VC.
Human Capital	Sweden offers world-leading talent and education in the workforce (Indigo Index Rank 1; Education Index Rank 19).[12,13] The workforce is digitalizing rapidly.[14] Gothenburg has a strong green labor market.[15] Educational clusters revolve around two science parks and the University of Gothenburg (THE Impact Ranking Rank 45),[16] partly involved in smart city developments (e.g. IRIS Smart Cities).[17,18,19]	Finland offers one a talented and educated workforce (Indigo Index Rank 3; Education Index Rank 21).[12,13] The workforce is digitalizing rapidly.[40] Green job availability in Vaasa is centered around the local energy industry, a science park complementing the industry in construction.[41] Vaasa is a small university town home to three higher educational institutions.
Policy	Sweden has some of the strongest environmental and social policy foundations in the world (SGI 8.7 and 7.4; GGEI Rank 1).[20,21,42] However, local self-governance is encouraged, leading to differences between (local) policies and in developments in municipalities.[7] Although Sweden has a socialized economy encouraging entrepreneurship (EODB Rank 10; IoEF Rank 21) it does not offer the strongest ecosystem policywise.[10,22,23]	Finland has very strong environmental and social policy foundations (SGI 7.6 and 7.3; GGEI Rank 5).[20,21] Furthermore, the city of Vaasa has committed to carbon-neutrality by 2035, encouraging a more regional economy.[43] Finland has a socialized economy encouraging entrepreneurship (EODB Rank 20; IoEF Rank 19).[22,23] However, these policies seem to encourage entrepreneurship mostly in Helsinki ecosystem.[64]
Support	Gothenburg has a history of successfully integrating smart city solutions into the city.[24] However, previous case studies suggest that smart city responsibility split between municipalities and criticize the lack of a central support system.[7] Gothenburg is known for its relatively strong entrepreneurial ecosystem with multiple Incubators, co-working spaces and substantial networks.[25,26] The city tries to attract and offers support specifically for foreigner entrepreneurs.[27,28]	Vaasa has some previous smart city project experience.[44] However, Finland has much experience, especially Helsinki is known as one most innovative (smart) cities globally.[15,45,63] The city is part of the Network of Finnish Sustainable Communities.[35] Vaasa is home to the energy technology cluster of Northern Europe, focusing on green battery technology.[46] Local incubators and support systems revolve around this cluster, which will play an important role in the European energy transformation.[47]
Technology	On a country level we see one of the fastest technological developments compared to most European countries (Internet Speed Rank 3; III Rank 10; GII Rank 2; ICT Development Index Rank 11).[29,30,31,32] Sweden is a pioneer in e-governance (UN E-Governance Ranking Rank 5).[33] Accordingly smart city technologies being implemented especially in Stockholm and Gothenburg.[34]	On a country level we see one of the fastest technological developments compared to most European countries (Internet Speed Rank 6; III Rank 7; GII Rank 6; ICT Development Index Rank 22).[29,30,31,32] Finland is a pioneer in e-governance (UN E-Governance Ranking Rank 6).[33,48]

Table 5 *The smart city ecosystem of Alexandroupoli and Santa Cruz de Tenerife*

Dimension	Alexandroupoli, Greece	Santa Cruz de Tenerife, Spain
Community	Greece has a prevalence for small, local firms and self-employment.[49] Overall social and environmental improvements are slow (WHR Rank 77; EPI Rank 22; GCI Rank 42; SPI Rank 30).[1,2,3,4] There is limited accountability for improvements in line with the SDG.[50] Alexandroupoli offers a "quality of life committee".[51] Further research is needed, as information is not accessible in English.	Spain is doing well in social and environmental improvements (WER Rank 28; EPI Rank 12; GCI Rank 10; SPI Rank 17).[1,2,3,4] The Canary Islands are well-known for their high livability.[60] However, the focus is local as the community is (geographically) isolated.[61] The government website suggests a focus on citizen engagement in the development smart city development process.[62]
Finance	Country-wide financing opportunities are still sub-par as the industry is recovering from 2008 financial crisis.[10] However, there are clear improvements on a country-level.[52] Local financial support seems to be weak, as no institutionalized support exists.	The Spanish financial support industry is mediocre.[10] The Canary Islands are known for favorable tax rates and low costs of living. However, there is a lack of access to international funding, consequently funding for entrepreneurial opportunities is limited.[61]
Human Capital	Greece has word-leading tertiary enrollment rates, but the workforce still lacks necessary skills (Indigo Index Rank 42; Education Index Rank 28).[12,13,53,54,56] The city has one local university with sub-par ratings.[16] Information about the local workforce is sparse. The city clearly targets foreign tourists and not foreign workers. No government information for foreigners in English is provided about starting or joining local businesses. Entrepreneurial activities seem to be centered in Athens.[55]	Educational opportunities in Spain are good (Indigo Index Rank 19; Education Index Rank 32).[12,13,16] There is a focus on expanding green jobs in the Spanish economy, along with increased entrepreneurial activities in line with SDG.[10,65] Local opportunities mostly are centered around tourism, as the city clearly targets foreign tourists and not foreign workers.
Policy	Environmental and social policies are among the weakest in Europe (SGI 4.7 and 4.8; GGEI Rank 29).[12,13] Greece scores high in policies related to entrepreneurship but business activities are still constrained by red tape (EODB Rank 79; IoEF Rank 99).[10,22,23] Alexandroupoli has an ambitious local smart city development program revolving around more efficient energy consumption but it is unclear if local policies align with these goals.[57,58]	Spain has mediocre environmental and social policy foundations (SGI 6.3 and 6.5; GGEI Rank 33).[20,21] Spain scores poorly in policies related to entrepreneurship but policies related to doing business are decent (EODB 30; IoEF Rank 58).[10,22,23] Santa Cruz de Tenerife has an ambitious local smart city development program but it is unclear if local policies align with these goals.[66]
Support	Alexandroupoli has some previous smart city project experience and won the 2019 "Greek Green Award".[57,59] The city is a member of the Greek Green Cities Network and Covenant of Mayors initiative, both focusing on smart urban development.[57] The city does not have any institutionalized support for (smart city) entrepreneurs.	Santa Cruz de Tenerife has some previous smart city project experience and is a member of Spanish Smart City Network.[66] There are local entrepreneurial communities revolving around two incubators, but truly global networks are absent.[61]
Technology	On a country level we see relatively slow technological developments compared to most European countries (Internet Speed Rank 72; III Rank 42; GII Rank 39; ICT Development Index Rank 38).[29,30,31,32] Greece is a lagging behind in e-governance (UN E-Governance Ranking Rank 35).[33] Most information about local technological development, such as progress on e-governance (e.g. the local municipality website) is only available in Greek. Greece is working on expanding their e-governance programs, partly to encourage entrepreneurship.[10]	On a country level we see technological developments at a medium pace compared to most European countries (Internet Speed Rank 24; III Rank 24; GII Rank 27; ICT Development Index Rank 27).[29,30,31,32] Spain developing their e-governance program well (UN E-Governance Ranking Rank 17).[10,33] However, Santa Cruz the Tenerife has a low degree of development in public services provided with innovative technologies compared to other Spanish cities.[67] There are local initiatives to improve e-governance specifically.[66]

Table 6 *The smart city ecosystem of Focsani*

Dimension	Focsani, Romania
Community	Romania is a quickly developing economy, leveraging its integration into the EU. However, social and environmental development are still lagging behind (WER Rank 47; EPI Rank 45 GCI Rank 29; SPI Rank 45).[1,2,3,4] Local smart city projects seem to be including the community.[68] Further research is needed, as information is not accessible in English.
Finance	In Romania international investment opportunities are increasing, but overall financial opportunities are still weak.[69,77] Institutional support is weak.[69,76] In Focsani, there seem to be no local financing opportunities.
Human Capital	Romanian education is improving (Indigo Index Rank 56; Education Index Rank 51).[12,13] However, there are still limited higher education opportunities, especially for the less well off.[70] Focsani offers no universities or higher educational institutions. The local population is declining and so is the local workforce.[71] The local workforce is centered around lower-skill, non-digitalized jobs especially agriculture.[72]
Policy	Environmental and social policies are weak (SGI 6.0 and 4.5; GGEI Rank 63).[12,13] Government policies towards entrepreneurial activities are improving and on-par with countries of similar GDP per capita (EODB 55; IoEF 38).[22,23,73] Focsani has an ambitious local smart city development program but it is unclear if local policies align with these goals.
Support	Focsani has some previous smart city project experience.[74] The city does not have any institutionalized support for (smart city) entrepreneurs. Further research is needed, as information is not accessible in English.
Technology	On a country level we see one of the slowest technological developments compared to most European countries (Internet Speed Rank 13; III Rank 61; GII Rank 48; ICT Development Index Rank 58).[29,30,31,32] Romania is a lagging far behind in e-governance (UN E-Governance Ranking Rank 67).[33] However, the access to high-speed internet has been improved significantly over the last years.[29] Focsani's city website is only available in Romanian and clearly lacks behind the latest trends in design and functionality.

Appendix B – The Smart City Business Model Canvas

Key Actors

Who are the smart city network key actors?
(Completed by the solution provider in collaboration with the City)

- *Actor 1 (city)*
- *Actor 2 (end-user)*
- *Actor 3 (core partner)*
- *Actor 4 (supporting partner)*

Who are the key suppliers?
(Completed by the smart city solution provider)

- *Supplier 1*
- *Supplier 2*
- *Supplier 3*

Key Activities

Which key activities are required to realize the value proposition (i.e. build distribution channels, customer relationships, revenue streams, build products/services/platforms, install equipment)

(Completed by each actor involved in realizing the smart city solution)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Value Proposition

What value does each actor delivers?
Which of the end users' problems is the smart city project helping to solve?
What bundles of products and services does the project offers to each end user?
Which end-users needs is the project satisfying? (i.e. performance, customization, price, getting the job done, cost reduction, risk reduction, accessibility, convenience/usability)
What are the respective target values/thresholds/KPIs to be reached?

(Completed by each actor involved in the smart city project creating value)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Actor Relationships

Which type of relationship does each actor expect within the network?
Which ones are established?
How are they integrated with the rest of our business model?
How costly are they?

(Completed by each actor involved in realizing the smart city solution)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Network Beneficiaries

Which target users is the value created for?
How the target users benefit from the value created and what are their needs?
What specific values each network beneficiary gets? (i.e. Community, business, research organizations, decision-making bodies/government and non-profit).

(Completed by the smart city solution provider in collaboration with each actor involved in realizing the project)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Key Actors Offerings (*)

What offerings does each actor deliver? (i.e. technology, development of products/processes/services, R&D, Citizen Engagement)

(Completed by the smart city Key Actors in collaboration with the city)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Key Actors Co-creation Operations (*)

Which key operations do the key actors perform? (i.e. sourcing of materials, systems's design, operation and monitor and impact monitoring of the smart city solutions, deliver value, city coverage and links to other stakeholders e.g. innovation hubs)

(Completed by the smart city Key Actors in collaboration with the city)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Key Resources and Infrastructure

What key resources are required to realize the Value Proposition (buildings, vehicles, machines, systems, point-of-sale systems, and distribution, networks)
Our deployment channels?
Our actor relationships?
Revenue streams?

(Completed by the smart city solution provider in collaboration with the city)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Data (*)

What data will be made available from the services designed?
To whom and under what conditions? Availability and types of Open Data (i.e. energy efficiency, climate indicators, traffic etc)

(Completed by the smart city solution provider in collaboration with the city and actors involved)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Deployment Channels

Through which channels do our customers want to be reached?
How are we reaching them now?
How are our channels integrated?
Which ones work best?
Which ones are most cost efficient?
How are they integrating with the customer routines?

(Completed by the smart city solution provider in collaboration with the city and actors involved)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Budget Cost

What are the most important costs inherent for each actor deploying a smart city solution?
Which key resources are the most expensive?
Which key activities are the most expensive?
What cost can be covered by each actor?
Is there opportunitiy for blending public funding with private financing? Which costs are covered by each mechanism?
(Completed by the smart city solution provider in collaboration with the city)
Actor 1 (city):
Actor 2 (end-user):
Actor 3 (core partner):
Actor 4 (supporting partner):

Revenue Streams

For what value are the network beneficiaries really willing to pay?
For what do they currently pay?
How are they currently paying?
How much would they prefer to pay?
How much does each revenue stream contributing to overall revenues?
Which actors have revenues?
What are the non-monetary revenues?

(Completed by the smart city solution provider in collaboration with the city)
Actor 1 (city)
Actor 2 (end-user)
Actor 3 (core partner)
Actor 4 (supporting partner)

Environmental Impacts: Costs and Benefits

What is the ecological cost of the smart city solution? (i.e. Greenhouse gas emissions, land use, energy and water used)
What is the ecological benefit of the smart city solutions?
% of reducing energy consumption
% reducing the environmental footprint

(Completed by the smart city solution provider and the smart city)

Social Impacts: Values and Costs

What is the negative social value generated by the Smart City Solutions?
(i.e. Social exclusion, digital illiteracy, accessibility to advanced services etc.)
What is the positive social value generated by the Smart City Solutions?
(i.e. Growth, job creation, air quality, less traffic etc.)

(Completed by the smart city solution provider and the smart city)

Appendix C – The Smart City Business Model Canvas filled out in context of the mobility as a service solution provided by Trivector/EC2B in Gothenburg

Building Blocks	Question(s)	Agent(s)	Content
Key Actors	Who are the smart city network key actors?	Municipality of Gothenburg	The local municipality.
		E-Verhicle Users / Tenants	The tenants of the newly developed housing. They gain access to the MaaS offerings (car, bike and light vehicle sharing) within the development instead of having a parking garage.
		EC2B / Trivector	Trivector is a Swedish mobility consulting company. Trivector funded EC2B daughter company to show long-term commitment to the MaaS business model tested in this pilot.
		Property Developers (Riksbyggen)	Companies building new housing in the area of Gothenburg. This project covers the developer Riksbyggen who piloted the MaaS solution within a new building comlex in Gothenburg.
		IRIS Smart Cities	An EU-spanning smart city project. Activley involved in this pilot project by providing funding and learning from the results.
	Who are the smart city network key suppliers?	SmartResenär	The EC2B app has been implemented based on a MaaS ICT platform from the subcontractor SmartResenär. SmartResenär assists Maas operators by supplying bespoke development and customisation services. The SmartResenär platform consists of three main parts: a frontend component library for rapid mobile app development, a collection of generic MaaS backend services and tools that runs on SmartResenär servers and an integration layer where API integrations towards mobility suppliers are implemented and managed by SmartResenär.
		Västtrafik	Västtrafik is responsible for public transport in western Sweden. This is the first time a public transport operator in Sweden opens up to sell their digital tickets through a third-party digital retail channel. So for only for a trial period until the end of 2019. Trivector is involved in a constructive dialogue on a continuation.
		Sunfleet (now: "our green car")	E-cars are leased through car sharing operator Sunfleet, which has a contractual agreement with Riksbyggen. Normally this fleet provider provides Volvo cars but due to IRIS funding electric cars were obligatory. This provider has been replaced (by "our green car"). The services offered did not change.
		Riksbyggen	Riksbyggen has procured the e-bikes and the key cabinet. Riksbyggen owns GoRide (bikes).
		Clean Motion	Light e-vehicles were leased through Clean Motion. These providers offerings have been canceled due to a lack of interest by the tenants. There was no willingness to pay, possibily because vehicles were "too new" for tenants.

Building Blocks	Question(s)	Agent(s)	Content
Key Activities	Which key activities are required to realize the value proposition? Definition: In the SC-BMC, key activities refer to the management and delivery of activities of the actors involved in the smart city solution, capitalizing on the offerings by each network actor and working toward realization using co-creation practices.	Municipality of Gothenburg	Provides the setting, which allows the pilot project to take place. The project is based on an innovative policy that should allow the business model to work sustainably. The policy was based on flexible parking norms, enabeling car sharing instead of offering parking space. The policy involves rebates for parking requirements. This means property developers have to build less parking per tenant in new developments. The more ambitious the the mobility solution, the bigger the rebate (a ratio, e.g. one parking space for every tenant).
		E-Verhicle Users / Tenants	They are the every-day users and provide payment for the service. Interest in and accessibility of the offerings are key.
		EC2B / Trivector	Expertise in mobility solutions to help urban developers developers explore and integrate MaaS solutions. Sustaining relationships between all parties. Consolidating the suppliers by integrating them into a single solution. An app which is a convinient tool for the end-users.
		Property Developers (Riksbyggen)	In new developments they provide payment for the inital part of the solution (except in this case the project was subsidized by IRIS Smart Cities). They build the foundation for the solution by providing infrastructure. No car parking but instead e-vehicle storage and charging. In this development a special focus was on community space, etc. It is unclear if this "culture of community" has an effect on the mobility solution.

Building Blocks	Question(s)	Agent(s)	Content
Value Proposition	What value does each actor deliver? Definition: Value proposition refers to the benefits each actor in the network creates for a single or multiple end user in the network	Municipality of Gothenburg	Implementing additional mobility services to provide higher flexibility when travelling, reducing the need to own and use a car. Contribute to a "good economy" in the construction of new accommodation and create attractive urban spaces. Ultimatley, the municiaplity wants to create a more attractive urban environment and sustainable development with fewer cars and a significantly more efficient land use.
		E-Verhicle Users / Tenants	Provide payment for the solution. Provide feedback for service. Ideally citizens engage in activley improving the solution to create a more sustainable urban envrionment-
		EC2B / Trivector	Trivector (EC2B) brings together the services of others in an integrated offer which benefits both mobility providers (who can gain a broader audience), and users. Value generation includes: Helping residents to a carefree mobility without the need to own a car. Helping real estate developers to offer the market a low-car housing concept through a package solution, attractive to both customers (residents) and authorities (the municipality). These communicate to the municipality that that the mobility solutions is in good hands. Which in turn profits the property developers who have to obtain a green light for their project. Helping mobility service providers who want to reach a larger and affluent market for their sustainable mobility services.
		Property Developers (Riksbyggen)	The project has shown that many property developers in the sector of commercial properties are interested in offering their tenants – and employees – a sustainable mobility service also in existing buildings. Propery owners/developers facilitate alternative options for tenants to be more sustainable by paying and providing them the EC2B service.
	Which of the end users' problems is the smart city project helping to solve?	Property Developers (Riksbyggen)	The focus of Trivevctor/EC2B is to primarily reach property owners who have a desire to develop sustainable alternatives for their accommodation and excel as leading sustainable players (based on the policy introduced by the government). Currently most urban developers do not have the expertise to provide these solutions by themselves. However, Riksbyggen would probably not have payed for the EC2B service if it wasn't funded by the EU. They planned on using seperate services for every vehicle category. The overall value added for the property developer is still unclear.
Building Blocks	**Question(s)**	**Agent(s)**	**Content**
	What bundles of products and services does the project offer to each end user?	Property Developers (Riksbyggen)	Trivector/EC2B offers complete solutions to property developers, who seek to integrate MaaS solutions into their new development. However, the property developer disagrees that the offering is complete as much work must still be done by the developer to integrate the solution (contracting, interaction with tenants, etc.). In the future the property developer would appreciate a complete solution.
	Which end-users needs is the project satisfying? (e.g. Performance, customization, price, getting the job done, cost reduction, risk reduction, accessibility, convenience/usability)	Property Developers (Riksbyggen)	Cost reduction: Urban developers can save costs by replacing building a car garage in favor of integration of a MaaS solution. Getting the job done: Trivector/EC2B is one of the most reputable mobility consulting companies and can also work in more novel projects like this one.
	What are the respective target values/thresholds/KPIs to be reached?	Municipality of Gothenburg	Diverse KPIs related to envrionmental and social progress set by the local government (e.g. improved access to vehicle sharing solutions; ease of use for end users of the solution; reduction in car ownership among tenants; yearly km driven in e-car sharing systems; reduction in driven km by users of the service; energy savings; carbon dioxide reduction)
		E-Verhicle Users / Tenants	None.
		EC2B / Trivector	Further research needed. (6)
		Property Developers	

Building Blocks	Question(s)	Agent(s)	Content
Actor Relationships	Which type of relationship does each actor expect within the network? Which ones are established? How are they integrated with the rest of our business model? How costly are they?	Municipality of Gothenburg	The municipality keeps contact with property developers to check-in on learnings about the "no-car pilot". There is a relationship with MaaS providers, which is needed to expand/scale up the business model in the future. There is a relationship with other municapitalities and the EU for sharing learnings, planning and funding of similar pilots.
		E-Verhicle Users / Tenants	Due to the innovativness of the project there is a close relationship between tenants and MaaS solution provider. This is a very costly relationship and it is unclear if a similiar relationship is needed in other MaaS projects. However, it is clear that the close interaction helped intially sceptical tenants to "warm up" to the solution.
		EC2B / Trivector	Ability to build long-lasting relationships with both property developers and mobility service providers, as well as to navigate within the legislative and political landscape. Close interactions with property developers is key to form good, trushworthy relationship. Forming long-term business relationship with partners is considered Trivector's strenght in the sector. Succuessful relationships are needed for Trivector to find new customers.
		Property Developers	Counterparty to the relationships mentioned above.

Building Blocks	Question(s)	Agent(s)	Content
Network Beneficiaries	Which target users is the value created for? How do the target users benefit from the value created and what are their needs?	Property Developers	Property Developers are the end user of this business model by purchasing mobility solutions from Trivector. (See Value Proposition)
	What specific values does each network beneficiary get? (i.e. Community, business, research, organizations, decision-making bodies/government and non-profit)	Municipality of Gothenburg	Less cars in the area, which fulfils policy goals. Possibly increased use of public transportation. Network effect: The more mobility solutions there are, the more choices and the more flexible the services are for the end users, which profits the city as more citizens might forego car ownership. However, from the municipalities perspective an integrated MaaS solution is not neccessary. Mobility offerings by itself (not ingetrated into one platform) would also be a solution if certain criteria is fulfilled. Decisions about these critiera are made on a per project basis.
		E-Verhicle Users/Tenants	Tenants have access to electric cars, electric cargo bikes and five electric bikes, as well as public transport. There might also be other benefits. Property developers invest into different offerings instead of building a parking garage such as a common rooms, etc.
		EC2B / Trivector	Income and further expertise for their next projects. Possibly new connections, expanding the company network.
		Mobility Providers	Access to a bigger market by integration into the mobility offering. So far no fee is charged for particpation in the project but that might have to change in the future.
		Property Developers	There is a financial incentive, it's cheaper for them to build the MaaS solution compared to a car garage.
		IRIS Smart Cities	Learnings from pilot project, which is considered the reason for investing in the project to begin with.

Building Blocks	Question(s)	Agent(s)	Content
Key Actors Offerings (1)	What offerings does each actor deliver? (i.e. technology, development of products/processes/servcies, R&D, Citzen Engagement, etc.)	Municipality of Gothenburg	Support for the EC2B concept to be viable. Local authorities need to be supportive of the idea of exchanging parking lots for a MaaS. In this case a policy-based innovation was neccessary. (Related: Lund wanted to pilot a zero-parking housing for about ten years. Just now it is catching interest, seemingly the government is more ambitious than the private sector in this regard.)
		E-Verhicle Users / Tenants	Willingness to pay for the service. Some tenants are more likley to use new vehicles than others. In this case when using light e-vehicles there is a certain customer group that thinks the vehicles are "cool".
		EC2B / Trivector	Development of the EC2B application to be used was procured by Trivector within the IRIS project. However, the main focus of the EC2B demonstration in IRIS is not on the app or the ICT scheme behind it. Rather, the focus is on designing a service that responds to the needs all actors involved: end-users as well as property developers and transport service providers, in order to find a working business model. The ICT-solution used in the project is a necessary prerequisite for being able to demonstrate a MaaS service, but it has a subordinate role. Citizen engagement. User dialogue and the possibility for users to get personal travel advice has been seen as a key part of the EC2B concept all along.
		Property Developers	Development of the housing complex, focusing on solutions to integrate MaaS and other offerings for new tenants.

Building Blocks	Question(s)	Agent(s)	Content
Key Actors Co-creation Operations (3)	Which key operations do the key actors perform? (i.e. Sourcing of materials, system's design, operation and monitor and impact monitoring of the smart city solutions, deliver value, city coverage and links to other stakeholders e.g. Innovation hubs	Municipality of Gothenburg	Further research is needed.
		E-Verhicle Users / Tenants	
		EC2B / Trivector	
		Property Developers	
Key Resource and Infrastructure	What key resources are required to realize the Value Proposition (buildings, vehicles, machines, systems, point-of-sale systems, and distribution, networks) Our deployment channels? Our actor relationships? Revenue streams?	Municipality of Gothenburg	City-wide infrastrucutre such as public transport and bike lanes and parking. Oftentimes also route planning software/integration. Ideally, the city could be able to provide more infrastructure for innovations like e-cars to increase the likelihood of fast scaling solutions. However, for a Swedish city Gothenburg is relativley car-orientated (Volvo HQ).
		E-Verhicle Users / Tenants	Smart phones and access to the internet.
		EC2B / Trivector	Work force to include the MaaS solution both on a technical as well as societal level.
		Property Developers	Buildings and infrastrucutre to provide setting for MaaS solution including: car sharing space and charing ports; (e-)vehicle space and charing ports; bike garage and workshop, etc.
		Suppliers (2)	There must be (local) suppliers to provide vehicles for the business model to work.
Data (4)	What data will be made available from the services designed? To whom and under what conditions? Availability and types of Open Data (i.e. Energy efficiency, climate indicators. Traffic etc)	Municipality of Gothenburg	Gathers data from the property developers on how the project is going. Further research is needed about the exact content.
		E-Verhicle Users / Tenants	Further research needed involving a more technical perspective.
		EC2B / Trivector	Information needed for KPI measurement is collected through the app and from collaborators (e.g. statistics on number of trips with different vehicles/public transport or trip length for e-cars).
		Property Developers	Further research needed involving a more technical perspective.
Building Blocks	**Question(s)**	**Agent(s)**	**Content**
Deployment Channels	Through which channels do our customers want to be reached? How are we reaching them? How are our channels integrated? Which ones work best? Which ones are most cost efficient? How are they integrating with the customer routines?	Property Developers	The property developers of project Viva got connected via Johannaberg Science Park (and then to IRIS Smart Cities). In general property developers are reached through webinars and innovation seminars, specialized on MaaS networks. So far feedback for the concepts mainy positive, interest for similar offerings since a long time but only now projects are starting.
		E-Verhicle Users / Tenants	The tenants are reached via a (web) application to book and manage vehicles. Furthermore, the mobility coaching plays an essential role in communication (see Key Relationships).
Building Blocks	**Question(s)**	**Agent(s)**	**Content**
Budget Cost	What are the most important costs inherent for each actor deploying a smart city solution? Which key resources are the most expensive? Which key activities are the most expensive? What cost can be covered by each actor? Is there opportunity for bledning public funding with private financing? Which costs are covered by such mechanism?	Municipality of Gothenburg	Complementory infrastructure to make MaaS a possible solution for citizens, thereby providing a real alterntive to car ownership. This means that cities who do not have a certain amount of infrastrucutre might not be able to integrate MaaS soltuions effectivley.
		E-Verhicle Users / Tenants	The only cost are renting vehicles for tenants. The users pay for a mobility solution, which is (hopefully) cheaper than car ownership. So far bikes so far for free, car usage is payed. This might change in the future. However, if garage had been built tenants would have needed to pay off build costs instead (regardless of use). A cost/benefit analysis from the tenants was not possible due to lack of financial data.
		EC2B / Trivector	Developing and integration the mobility solution. Payment for the maintanance of the vehicles (5). Very close connection to tenants providing mobility coaching.
		Property Developers	Building the development with the right infrastructure to provide the EC2B service. Building an underground garage is a very expansive endavour in Sweden, so property developers are interested in forgoing the cost. Furthermore there are now incentives by the government to fund such projects (savings through car-free housing are about 90-95% of conventional parking requirements). Currently, property developer would be unwillig to pay if the service wasn't subsidized. Only once EC2B is proven to be self-sustaining business model, property developers would think it is worth the integration.

Building Blocks	Question(s)	Agent(s)	Content
Revenue Streams	For what value are the network beneficiaries really willing to pay? For what do they currently pay? How are they currently paying? How much would they prefer to pay? How much does each revenu stream contributing to overall revenues? Which actors have revenues? What are the non-monetary revenues?	Municipality of Gothenburg	In the current business model the municipality does not inncur any direct revenue. Indirect revenue might incur as the solution might stimulate public transport use. There is a willingess to fulfill their policy goals: Less cars, more usage of public transport, greener environment (better quality of life).
		E-Verhicle Users / Tenants	Mobility in urban space is somewhat of a given, so users expect a meaningful alternative if they previously relied on car usage. (see Budget Costs)
		EC2B / Trivector	Receiving payment for their bundles provided to property developers. Furthermore, non-monetary revenues involved: experience, expertise and networks for new possible contacts.
		Property Developers	Main revenue stream for Trivector. This can still be a "win-win" as property developers save money through avoiding the construction of expensive car infrastrucutre. In the future property developers want car providers to pay them, as they are gaining many new customers. Property developers also gain expertise by pilot projects like this.
		IRIS Smart Cities	This project is subsidized by the European Union. Therefore, the property developer did not incur any costs. Willingness to pay for a pilot project, gaining expertise and insights about the feasability of such a mobility solution.
Environmental Impacts: Costs and Benefits	What is the ecological cost of the smart city solution? (i.e. Greenhouse gas emissions, land use, energy and water used) What is the ecological benefit of the smart city solutions? % of reducing energy consumption. % reducing the environmental footprint.	Postive Aspects	A previous study suggest that if 200 persons in the 132 apartments at Brf Viva join the car sharing service included in EC2B, their carbon footprint from transport can be expected to be reduced by 123 tons of CO2. (See sources for addtional details). Current "green transformation" of the transportation sector does suggest that building more parking in new developments might be very wasteful.
		Negative Aspetcs	New vehicle aquisition still does impact the envrionment but it is the better alternative over personally-ownned vehicles.
Social Impacts: Values and Costs	What is the negative social value generated by the Smart City Solutions? (i.e. Social exclusion, digital illiteracy, accessibility to advanced services) What is the positive social value generated by Smart City Solutions (i.e. Growth, Job creation, air quality, key traffic etc.	Postive Aspects	Direct and measurable: less trafic, improved air quality, less reliance on your car. Some tenants graduadly give up their car after living in the housing complex for a while. Indirect: social inclusion and community of sharing. Unfortunatley, community of sharing is not really happening as planned. Pilot for the "housing of the future". The property developer does think pilots like these are an important part of transitioning towards different modes of transport.
		Negative Aspetcs	The business model is new for all actors. Long-term implications and economical viability is unclear. Complicated for older tenants that suffer from digital illiteracy (integrated coaching helps overcome this problem). Car owners are clearly discriminated (however there is a self-selection effect between owners of the flat). Tenants are much higher educated than average (located close to a university and "innovative building"). Tenants seem to view the service as more of a complementary good than a sustainability neccsasity.

Sources and Comments

#	Name	Type	Perspective	Link (if applicable)
1	Interview between Britt Kuipers and Emma Lund	Interview	Trivector/EC2B	–
2	Interview between Britt Kuipers and Charlotta Brolin	Interview	Property Developer	–
3	Interview between Britt Kuipers and Christian Rydén	Interview	Municipality	–
4	Adopting Mobility-as-a-Service: An Empirical Analysis of End-Users' Experiences	Academic Publication	Tenants	Available at Google Scholar
5	IRIS Deliverable 7.5 – Activities on Smart e-mobility (Gothenburg)	Report	Project Overview	https://www.irissmartcities.eu/public-deliverables
6	IRIS Webinar: Developing & applying a successful Mobility As A Service (MaaS) business model	Presentation	Trivector/EC2B	https://www.youtube.com/watch?v=NYO-vZRALRU
7	IRIS Smart Cities – Website	Website	Project Overview	https://www.irissmartcities.eu
8	Brf Viva – Riksbyggen	Website	Project Overview	https://www.riksbyggen.se/ny-bostad/aktuella-projekt/vastra-gotaland/brf-viva/
9	Brf Viva – Johannaberg Science Park	Website	Project Overview	https://www.johannebergsciencepark.com/en/news/moving-housing-project-viva-riksbyggen-gothenburg
10	Brf Viva – Smart City Sweden	Website	Project Overview	https://smartcitysweden.com/best-practice/353/brf-viva-positive-footprint-housing/
	Not yet included in this iteration			
1	Interview between Britt Kuipers and Dennis Kerkhof	Interview	Property Developer	–
2	Interview between Britt Kuipers and Goran Smith	Interview	Tenants	–

#	Comment
1	There is much overlap with the contents of Value Proposition.
2	Even though suppliers are not included in the proposed SC-BMC canvas, we felt the need to include them here.
3	This is very in-depht information and the overall value to the business model analysis is comparativley low.
4	In order to answer these questions, detailed information from a more technical perspective is needed.
5	A lack of financial overviews left us unable to understand the exact economical implications of the business model.
6	Based on the research we expexted business related KPIs to play a bigger role in the project. We were not able to confirm this hypothesis.