Following the Smartness: Leipzig as a Follower City in a Horizon 2020 Smart Cities and Communities Lighthouse Project

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1 ABSTRACT

For the European Union, smart cities are cities socially, environmentally and economically sustainable, preparing to be the catalysts of innovative changes for the world. Accordingly, the European Commission (EC) has a series of programmes to support the transition from cities to smart cities, such as the Horizon 2020 programme for research and innovation. The Triangulum project is one of the first projects in this programme, which trusts on the idea of replicating solutions to reduce the risks for decision-makers and business alike. The goal of replication within these projects is to enable the Follower Cities to replicate the implementation of smart solutions done in the Lighthouse Cities.

Triangulum developed the concept and framework of an extensive replication process that relied on workshops, city assessments, on-site visits and other tools, with dedicated personnel, time and budget. Through the funding possibilities of these programmes, the EC mobilises the smart city policy, providing the chance for cities to embark on the smart city world.

Leipzig (Germany) is currently a Follower City within the project. It has changed from a shrinking city to the fastest growing city in Germany and now faces the challenges to accommodate the growing population, secure a new economy while improving its liveability and sustainability, with its ageing infrastructure and financial limitations. By seizing the momentum of growth, Leipzig seeks to overcome its restraints, especially the limited financial resources, exploring its potentials and thus following a new sustainable path through the smart city idea.

This paper aims at identifying the real benefits of the 'replication' process designed within the project. By looking closely at Leipzig as a Follower City in Triangulum, it is possible to reflect on the meaning of replication in the European smart city context.

Keywords: Triangulum, Follower cities, Replication, Leipzig, Smart City

2 INTRODUCTION

The concentration of the majority of the world population in urban areas, a relatively new and fast-paced phenomenon, has conveyed the recognition of the duality and undeniable importance of cities in the face of environmental, economic and social challenges. With the concentration of population, cities concentrate the use of resources and emissions, but also concentrate money, knowledge generation, and innovation potential, creating a duality of being part of both the problem and solution (UN Environment Programme, 2018; UN-Habitat, 2016; United Nations, 2019).

The concept of smart cities arose amidst this recognition of the duality of cities and aims at unlocking the potential of cities to tackle the environmental, economic and social challenges. The concept evolved beyond solely digital technologies and is being embraced by cities worldwide. However, the smart city concept has a multitude of definitions and real-life implications. The technological, efficiency, and connectivity idea of smart cities corroborate with the processes of looking elsewhere, with the search for best practices and continuous benchmarking. As a result, mobilisation, transfer and replication of policies and ideas between cities are increasingly part of urban policymaking and planning. Different actors engage in these processes, in the hope of finding quick-fix solutions. For cities, belonging to this abstract space of globalisation, this signifies unlimited access to the flows of ideas, knowledge, money, people and possibilities, connoting a sense of relevance and attractiveness. Nevertheless, there is still the need to ground policies and solutions in the territoriality of cities and with social and institutional contexts, showing the duality of the fixity-mobility in these processes. That is relevant especially when considering the smart and digital technologies, that already denote a less localized and more abstract idea (Boulanger & Nagorny, 2018; Calzada, 2016; Cochrane, 2007; Cochrane & Ward, 2012; Dolowitz & Marsh, 1996, 2000; Gudmundsson et al., 2005;

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Hollands, 2008, 2015; Macário & Marques, 2008; Macmillen & Stead, 2014; McCann, 2011; McCann & Ward, 2011; Peck & Theodore, 2010; Stead, 2012; Vandevyvere, 2018).

2.1 The Triangulum project

The EC published an open call within the Horizon 2020 work programme at the end of 2013 called 'Smart Cities and Communities (SCC)'. The aim was to identify, develop and deploy replicable, balanced and integrated solutions in the sectors of energy, transport, and information communications technology (ICT) actions through partnerships between municipalities and industries.[1] The Triangulum Project was one of the first three projects from this call and is composed by the Lighthouse Cities (LCs) of Manchester (United Kingdom), Eindhoven (Netherlands), and Stavanger (Norway), with three Follower Cities (FCs) – Leipzig (Germany), Prague (Czech Republic), and Sabadell (Spain). The consortium is made up of 22 partners and is coordinated by the Fraunhofer Institute for Industrial Engineering (IAO). This innovation and demonstration project integrates and deploys smart city solutions in the area of energy, mobility, and ICT to face societal challenges. Moreover, it contributes to sustainable and eco-friendly urban development, reduces CO_2 emissions and promotes the use of renewable energy. At the same time, FCs are learning from the concepts, processes and reflecting on these for their own smart city strategies. Triangulum has received a 25 million euro grant from the EC and lasted five-years (2015-2020).

2.2 Follower City of Leipzig

Leipzig is one of the most dynamic cities in the heart of Germany with more than 590,000 inhabitants (2017). From the end of the former German Democratic Republic and reunification of Germany, this city faced numerous challenges, with losing population, deindustrialisation and high unemployment, to cite a few. However, since 2005 the population in Leipzig has been increasing steadily, and projections anticipate that the population growth will continue, making Leipzig one the fastest growing city in Germany (City of Leipzig). After years of population decline and an above-average unemployment rate, Leipzig started to regain popularity during the last years and is successfully turning from a post-industrial into a modern, knowledge-based economy, with a high concentration of small and medium enterprises and a lively start-up scene (City of Leipzig, Triangulum, D6.5 – Revised implementation plan Leipzig).

Leipzig, as a FC, takes advantage of the experiences gained and lessons learnt from the implementation processes in Manchester, Stavanger and Eindhoven respectively. As part of the project, each FCs has to develop a smart city implementation strategy based on the tools and lessons learned from witnessing the implementation in the LCs. Within their strategy, Leipzig´s main objective focuses on setting an integrated approach, understanding the importance of using renewable energy sources and designing a new plan of multimodal traffic/logistics/ICT system solutions.

By taking the case study of Leipzig as a FC in Triangulum in the context of European smart cities through the EC funding programmes, it is possible to get an insight into the processes of mobilisation, transfer and replication and their influence on the implementation of smart city solutions.

3   METHODS

This research is based on extensive desktop research and in-depth expert interviews, supported by literature review. The literature review covered the topics of smart cities, its definition, characteristics, benefits and criticism, and the topic of mobilization of policies, transferability, replication and best practices in the field of urban planning and development. The desktop research comprised the analysis of documents, websites, publications, reports and deliverables from the European Union (EU) and the EC to the Triangulum Project and the municipalities. Semi-structured expert interviews were conducted with experts from the Follower City of Leipzig, the Lighthouse Cities of Manchester and Eindhoven, the Fraunhofer FOKUS, IAO, University of Stuttgart and the University of Manchester covering topics specific from their practice.

4   RESULTS

Subchapter 4.1 will present the results of the desktop research. It is an assessment of the settings that allowed the case study, Triangulum Project, to happen. By analysing the different documents, it was possible to

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[1] Work programme: https://ec.europa.eu/research/participants/data/ref/h2020/wp/2014_2015/main/h2020-wp1415-energy_en.pdf

understand the narrative from the different institutions and agencies and the methodologies and processes of their work and results from the project itself. Subchapter 4.2 will present the results of the interviews. From the interviews, it was possible to compare the narrative, objectives and results with the perceived practical experiences and details from the processes, work dynamics and relationships resulting from the project.

4.1 The case study

4.1.1   The Lighthouse and Follower Cities concept within the European smart city scenario

Triangulum is one of the projects that is part of the European Innovation Partnership on Smart Cities and Communities Lighthouse Projects (EIP-SCC). The EIP-SCC was an initiative by the EC as part of the targets of the EU 2020 Strategy, which accounts "for smart, sustainable and inclusive growth"[2], and also aimed at the European targets for climate and energy for 2020. An initial Strategic Implementation Plan (SIP) for the EIP-SCC was developed to guide and "speed up the transformation of European Cities into 'smart cities'" and is intended to set the necessary actions to create a framework so that cities can be improved for life and business, and to be able to reduce energy use, emissions and congestions. Moreover, it outlined the EIP-SCC ideas "on how to best harness innovative technologies, innovative funding mechanisms and innovative public private partnerships" (EIP-SCC, 2013, p. 2). One of the activities proposed in the SIP to ensure its implementation and therefore consolidate the aims of the EIP-SCC was the creation of several 'Lighthouse Initiatives'.

Even though the purpose of these 'Lighthouse Initiatives' suggested the idea to group the participant cities, it was never indicated clearly in the initial bid (2013), as no resources were explicitly allocated for these purposes. Nevertheless, the project coordinators of the first three SCC projects (Triangulum, REMOURBAN and GrowSmarter) identified the need of coming together to discuss common challenges and issues in Berlin at the Fraunhofer Urban Futures Conference in 2015. In the next years, the projects founded the SCC1 Board of Coordinators (BoC) and a Manifesto[3] to ensure cooperation across the projects. After the formation of the BoC, the EC saw the potential of this growing community (2-3 projects per year with a duration of 5 years each) to achieve their goal of scaling up the implementation of smart cities solutions in Europe. Thus, "creating scale and reducing risk for political decision makers as well as investors, to progressively support wider implementation across the EU" (EIP-SCC, 2019), which would also serve as a way to demonstrate the competitiveness of the European industry.

The concept of LCs and FCs works in a way that innovative pilot projects can be tested and demonstrate at the LCs and later replicated in the FCs. The pilot projects focus on sustainable mobility, energy, smart buildings, ICT and business opportunities. The concept creates a diverse experience that covers the main typologies of European cities. All the current seventeen European SCC Lighthouse Projects have the same structure of Lighthouse and Follower Cities, relying heavily on the replication idea, including partners from industry and academia (EIP-SCC, 2019; Smart cities Information System, 2019). In general terms, Triangulum aligns with the EC EIP- SCC SIP across the LCs, so recommendations can be made to the EC in the broader replication process of real solutions for smart cities and hence boosting the transition from cities to smart cities in the European context.

4.1.2   Replicating the experiences from Lighthouse Cities in the project of Triangulum

The LC in Triangulum are Manchester (UK), Eindhoven (NL) and Stavanger (NO), the FCs are Prague (CZ), Sabadell (ES) and Leipzig (DE), so the project reflects urban populations between 100k and 1,2m within six countries, aiming at the different typologies of European cities.

Within the project, a dedicated team from Fraunhofer (FOKUS, IAO), University of Stuttgart IAT and TÜV Süd was responsible for developing and facilitating the replication process. It consists of two different approaches, the technology transfer, and the customer centric approach. Simplistically, these two approaches depart from different poles to try to achieve the same goal, to support replication of smart city solutions.

The technology transfer approach is set on what the EIP-SCC programme has established as an agenda. It structured the learnings and information of the implementation of solutions in the LCs, and supplied it to the FCs, or any other city interested in replicating them. The customer centric approach departs from the other

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[2] EC 2020 Climate & Energy package: https://ec.europa.eu/clima/policies/strategies/2020_en [Last access: 04.02.2020]
[3] Triangulum Website: https://www.triangulum-project.eu/?p=3880 [Last access: 04.02.2020]

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pole, from the FCs. It is a supportive process to achieve a smart city implementation plan, through an assessment of the FCs needs so it can be linked with the LCs solutions.

The technology transfer approach outcome was addressed by the development of a replication tool (or Decision Making Tool, the names are used interchangeably), a public excel-based tool that can be downloaded from the site of the project and be used by anyone.[4] It is a user-friendly interface where filters can be applied to search for the smart city use cases from the LCs from Triangulum, and thus find the most suitable one depending on whether the user is a city or industry or if it has a specific goal or challenge. The 'use case' is defined as the unity of replication, employing technology to achieve a specific goal in a defined setting.

Collecting data from the LCs was necessary to develop the tool. During this process, the refinement of the necessary data occurred, where the team responsible for the technology transfer received feedback from the partners, from the LCs and FCs sides, on the type of information that was relevant and interesting for them, as well as making the template for the use cases more user-friendly. .

The second approach, the customer centric approach, was designed to support the FCs in a personalised way to process and develop their smart city implementation plan. The first step had the Morgenstadt City Lab in each FC, where the Morgenstadt Methodology[5] was applied, and a complete assessment of the cities was conducted. With the city assessment cities could identify their strengths, weakness, and the current state of the cities and where lays the smart city potentials. That was made through site visits to the FCs by the team responsible for replication. From that, different formats of activities were used to connect the FCs with LCs smart city solutions, but also to connect all stakeholders within the project. These formats included on-site visits, workshops and webinars with different topics at different stages of the project, where the data collected in the LCs could be shared, and the FCs could develop their implementation strategy gradually. The activities and the respective topics were based on the FCs specific training needs, which the replication team matched with the right partners, so that knowledge exchange could happen.

Both approaches of the replication process fed each other with information, so they were always adapting and transforming throughout the project. The activities and tools that were part of the process were designed with different levels of personalization, some being more directly linked with specific FCs than others, allowing a level of adaptability when necessary. They had ultimately the goal of linking the FCs, and other interested cities, to the implemented solutions of the LCs. Part of the replication process of Triangulum were regular evaluations of the activities by the different partners of the project, what facilitated improvements and adaptations by the replication team when necessary.

4.2 Replication for the FC of Leipzig

As presented before, Leipzig has been experiencing changes in its urban environment in recent years. While most changes are positive, they still bring new challenges for the city. Leipzig has benefited of European and national funds to support urban regeneration projects, and together with active civil engagement has been successfully strengthening its urban development.

The commitment of Leipzig with environmental goals has been on the agenda for a while, yet it gained more relevance over the years. Leipzig was invited by Fraunhofer to be a FC in Triangulum, matching the intentions of the city of exploring the smart city world. The participation of the city within a larger European programme was perceived as an excellent approach to deal with their sustainable goals, decarbonization and promotion of local business. The EU funding possibility and the central role that EU and national funding plays in urban development in Leipzig were relevant in the decision to join the project. Even though there was the intention to pursue a smart city approach, Triangulum gave the city a place to start their smart city process, as there was no institutional or political configuration for that. The work for the Triangulum project in Leipzig initially was done by a team that was allocated in the Office for Urban Renewal and Housing Construction Subsidies. The budget for the team came exclusively from Triangulum and there was no additional budget allocated for smart city solutions within the municipality.

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[4] Download of the tool: https://www.triangulum-project.eu/?page_id=3576 [Last access: 04.02.2020]

[5] Morgenstadt City Lab Prague: https://www.morgenstadt.de/content/dam/morgenstadt/de/images/projekte1/4_CityLab_ Prague_Executive_summary.pdf [Last access: 04.02.2020]. Morgenstadt City Labs: https://www.morgenstadt.de/de/projekte/city_labs.html [Last access: 04.02.2020]

4.2.1 Challenges within the project

The replication process inside Triangulum was perceived from different angles by the team from Leipzig. When considering replication in a direct way, meaning solution to solution, the process was perceived as laborious for them, with various factors presented as reasons for that. Moreover, as being part of a consortium, they had to comply with the scope of the project and the agreed proposal. The scope of the project determined that they have obligations to follow, such as deliverables, which are concrete documents and actions. Because of the project´s replication scope at the beginning, the city felt a pressure from the coordination side to choose within the implemented solutions in order to comply with the project plan. However, this risk was identified by the replication team and incorporated into the abovementioned replication customer centric approach.

The mismatch between the timeline of the project and the smart city/digitalisation process of the city was perceived by Leipzig as one of the reasons why replication was difficult for them. The project was structured in a way so that the first 36 months the LCs were dedicated to implementing the solutions, having the last 12 months to monitor them. By having to wait for the LCs to implement their solutions, Leipzig had time to start developing their understanding of smart city, but they also did not have anything to show for the city council and other city agencies about the solutions on the LCs, which was essential for them to communicate the possibilities of smart cities. For Leipzig, this had both negative and positive impacts. It was not a linear cause-effect, because they used the experience from the LCs as a best-practice scenario in different ways.

4.2.2 Challenges of replication

Another perceived reason by Leipzig on the difficulty in replicating was concerning the various context-related different conditions from the LCs to Leipzig. For example, the institutional structure of the public utility companies that were involved from the beginning in Leipzig was different in the LCs. Not only in terms of the institutional structure but also in terms of involvement and cooperation. Another example was the distinction between the legal system from Leipzig and Eindhoven, especially in the aspects of data protection, which can hugely influence and determine smart cities solutions. Other context-related differences were recognized between Leipzig and the LCs, in different levels from infrastructure to policies, regulations and cultural. These differences did not facilitate the direct replication of solutions as well.

Leipzig has a tradition with civic engagement in the planning process (Triangulum, D6.5 – Revised implementation plan Leipzig), and during Triangulum, they had different participation formats, like future labs, discussion evenings, series of lectures, where they invited the inhabitants of Leipzig West to discuss specific topics, e.g. mobility, energy. It was relevant for them to collect orientation regarding potentials but also the fears of the inhabitants with the whole smart city discussion. However, Leipzig as a FC had no funds for implementation of smart city solutions within the project of Triangulum, so the participation process stopped due to the lack of concrete results from the inhabitants' perspective. Even though their efforts did not stop; Leipzig had to partially stop the participation process and start to focus on other concrete actions, such as institutional restructuring or applying for new funding opportunities in order to proceed with participation in future projects and re-gain the credibility and approval of smart cities among the citizens.

4.2.3 Achievements

When deploying the replication customer centric approach, it became evident to the Leipzig's team that it was necessary to have structural changes in Leipzig to advance in the topic of smart city. The replication process of Triangulum indicated that every city has its own smart city timeline in mind, they might be facing different challenges in specific moments. That was the case with Leipzig. Their timeline was different from the project because they need to deal with other challenges first.

Triangulum created conditions so that Leipzig could develop new guidelines and evolve in the smart city process. By being part of this pioneering initiative, the city administration needed to commit with the process, and gain legitimation within the municipality to support this new challenge. Inspired by the experience from the LCs, Leipzig realised that they needed structural changes to address these topics. Thus, at the beginning of 2019 a new division, the Digital City Unit was created inside of the municipality responsible for smart city and digitisation issues. Leipzig's team from Triangulum developed together with other departments this new division. Besides being responsible for the final steps of Triangulum, they will consider new guidelines for smart city to have a more city-wide coordination role. Leipzig could also

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determine that they needed first to advance and consolidate the city digital transformation to be able to support the smart city idea, retaking the participation processes. As funding is still a crucial aspect for the implementation of smart city projects, the Digital City Unit also seeks for suitable funding options, as well as managing the two new EC funded projects that they are now part of SPARCs (SCC1) and EfficienCE (Interreg Central Europe Programme).

Both are direct results from Leipzig being part of Triangulum, from the knowledge gained by the team, and from the need for funding to implement smart city projects. It is relevant to emphasize that within SPARCS Leipzig changed from being a FC to become a LC, signalling their smart city development. Within their implementation strategy, Leipzig planned projects that can be linked in their majority to solutions implemented in the LCs from Triangulum. Some of the projects are now part of either SPARCS or EfficienCE, others are under evaluation. Nonetheless, their implementation is still in process.

4.2.4   Lessons Learnt

For Leipzig, the know-how exchange was of utter significance. The different activities and tools of the replication process allowed them to have access to the know-how of the LCs in their smart city pathway. They were able to have contact with relevant stakeholders of the LCs in this process, such as the private partners, which offered them different perspectives. In this way, they could also improve their relationship and create new connections with private partners in Leipzig. The neutral learning environment of the process relieved some of the pressure that such connections can create, and allowed the city of Leipzig to be more prepared in their setting. Nevertheless, to be able to do so, it is essential to have the right people to participate in such process since it will determine their level of engagement. The activities that had a higher level of customization, that were more specific to Leipzig's needs, facilitated the involvement of some partners, allowing a higher level of engagement and better outcomes for the city.

5   DISCUSSION

As previously stated, the EC intended with this new LCs mission, to speed up smart city implementation across Europe by having a programme where smart city implementations could be tested, recognized and validated, thus reducing risks for decision makers and investors. Despite promoting and relying on the idea of transferability and replication in their smart cities' programmes, the EC does not establish a clear framework or concept about how and what is replication means for them. In this way, EC leaves these tasks to be defined and shaped by each project consortium that needs to re-invent the wheel again and again. In their study, Boulanger and Nagorny say that "replication is not a 'natural' process but requires strategic planning and continuous mentoring" (Boulanger and Nagorny, 2018). The replication process of Triangulum exhibit that, indeed, replication requires planning, continuous mentoring, and dedicated time and personnel. That goes against the premise from the EC of having this programme to accelerate smart cities transition, even though the Triangulum process had beneficial outcomes, it is clear that replication is not an easy process.

The literature suggests that these processes (mobilising policies and ideas, transferability and replication) are not fast or straightforward and are subjected to different influences of the different actors. The literature also defends that these processes are complex, strongly dependent on context, and demand a high level of commitment (Dolowitz & Marsh, 2000; Macário & Marques, 2008; Macmillen & Stead, 2014; McCann, 2011; Peck & Theodore, 2010; Stead, 2012). They can be onerous processes. That might be especially true for cities that are trying to follow the 'best cities', trying to be part of the global networks, struggling to have budget and capacity to do so.

The way that the replication process was developed in Triangulum implies that replication cannot happen without having a 'mediator'. The amount of work and data that needs to be handled and the steps that need to be followed cannot take place between different cities outside the boundaries of specific projects or without someone exclusively dedicate to it. Both approaches of the replication process, the technology transfer and the customer centric approach have a setting that demands dedicated personnel and resources. That can be overwhelming to the ones involved and could undermine the learning process, which is perceived as the beneficial part of these processes (Boulanger & Nagorny, 2018; Gudmundsson et al., 2005; Macário & Marques, 2008; Macmillen & Stead, 2014; Stead, 2016). Most of the activities from the replication described here are part of a social process of the mobilisation of policies. Still, McCann (2011) also calls attention to

the fact that these activities can be time and budget dependent, what can limit who engages on them. In Triangulum, these limitations were not present, on the contrary, the project allowed partners to be part of them, and especially for municipalities such as Leipzig that have limited financial resources, this might represent unique opportunities. However, the experience showed the importance of having these cross-learning processes among not only these projects, but to promote urban transformations in general.

The know-how transfer that the replication process of Triangulum supported was what allowed Leipzig to engage in the two new projects SPARCs and EfficienCE. From the know-how, or process learning, where the LCs could show how was their process, it was possible to realise where the organisational and skill blockages are, and how to get around them. From that, it is possible to make a connection with the identification of different actions resulting from the use of best practices made by Macmillen and Stead (2014), even though their study was about sustainable mobility, the parallel is possible. More than heuristic learning, where the practitioners could perfect their understanding and the daily practice of smart cities and the processes that the LCs went through to make the implementation possible, they also did strategic articulations with the examples of the LCs. The strategic articulations motivated a change in the institutional structure of the municipality, thus securing smart city and digitisation in the city's agenda for urban planning. Not only for Leipzig did Triangulum serve as a way of doing strategic articulations. The LCs also saw the value of the demonstration in Triangulum, something similar to an advertisement campaign for smart cities. Even as LCs, they still need to foster the idea within their cities.

For Leipzig, however, most of the actions on the topic are still pilot projects as there is no suitable business model yet. Leipzig still depends on funding from other EC programmes or the national governments. The EIP-SCC, a smart city marketplace promoted by the EC, was developed to showcase the solutions from these 17 SCC1 projects and to display their bankability, as proven risk-free solution so other cities could simply implement them. However, each solution should be adapted to each city's reality, as it is not an easy and fast way, as it was shown in the case of Leipzig. Despite the unlocked smart city process, the commitment and progress that the city did on the topic of smart city, they still depend on funding to do so and the EC realised the importance of developing the business models of each solution rather than seeking for replication. As Leipzig became a LC within the SPARCs project, they could continue in receiving EC funding for their implementation of smart city solutions. Thus, there are no guarantees that demonstrated LC's solutions are risk-free. Leipzig's smart city projects are still considered from their perspective as pilot projects.

Triangulum unlocked a series of possibilities for Leipzig in the path to achieving CO2 reduction and a more sustainable future. However, the gains they had by being a FC were not because they managed to replicate any given smart city solution, but because they managed to identify their organisational blockages. What is possible to conclude is that for Leipzig as a FC, replication meant first, the already mentioned access to the flows of knowledge and capital, access to a global network where now they can actively engage. Secondly, it meant identifying their challenges and being able to define their framework to become a smart city, with a new institutional rearrangement. Finally, it meant learning and knowledge that they shared and exchanged with the other partners, and will continue to do. Triangulum allowed the city to start a new process; nevertheless, a process, not packages or solutions.

6 CONCLUSION

The findings of this research explore the influences in Leipzig of a smart city replication process, promoted by the EC and developed and applied within the scope of Triangulum. What could be perceived from the analyses of data and interviews is that the implementation of smart city solutions was not the direct outcome of Triangulum for Leipzig. Triangulum and the replication process unlocked a smart city process in the city, where they could engage in a network that allowed access to knowledge, ideas and capital. The knowledge sharing, especially concerning the processes of implementation, served as a way of promoting the idea of smart cities within the city government and amongst citizens so that the organisational and skill blockages could be overcome and the necessary changes could happen. The concept of smart cities and digitisation can still be so abstract that being part of such projects helps to foster the idea of what it could be and what can be accomplished through it, both for LCs and FCs.

Different literature, from the social science to the sustainable urban mobility perspective, imply that processes of transferability and replication can be overwhelming and onerous for the ones involved, demanding continuous attention. The findings here corroborate with the argumentation of the literature.

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Triangulum replication process required work from Fraunhofer and the University of Stuttgart even from before the project to be able to take place. They had dedicated personnel, budget, different approaches, several activities, and a considerable amount of data. The process also required careful design and constant guidance. Regardless the name 'replication process', what seemed more relevant while engaging in the replication activities for the practitioners of Leipzig was to learn the know-how, the processes of how to do it and what is behind the solutions. Hence, learning about the processes was more relevant than replicating technologies or solutions per se.

Leipzig is now fully engaged in a smart city agenda. This was just possible through Triangulum. Nonetheless, they still depend on funding to accomplish that agenda. Within the next years, Leipzig will have the opportunity as a LC to implement pilot projects and engage with their citizens again. Despite the learnings from Triangulum, its replication and its deployed solutions, Leipzig still does not have bankable solutions as implementations are not coming in a quick-fix risk-free way. This is not necessarily undesirable, but it is just not what was envisioned by the EC.

The local context of Leipzig was not appropriate for simple replication of Triangulum solutions. The context differences between Leipzig and the LCs of Triangulum were perceived as a hindrance to replication at various levels and for different aspects, including legal, institutional, financial, and cultural. Reduction of CO_2 emissions, sustainable development, new economy, digitisation and technology, are and will probably continue to be vital aspects for the future of Leipzig. However, the city will progress these objectives according to its own time, capacities and needs. The relevance of placing and grounding activities in the specificities of a city, the fixity of policies and cities cannot be underestimated, even when digital technologies seem to put everything into a more mobile or abstract place. Reflecting on the intentions of the replication concept might show that they need to be reconsidered. The challenges that persist, such as the lack of bankable solutions and funding opportunities other than EC and the faster pace for changes that might be needed for the environmental goals, should be considered in a new perspective. The network that was formed as one of the outcomes of the programme has the potential to divert from this established concept and explore innovative ways to address these challenges.

The success of smart cities or sustainable cities that can comply with environmental, social and economic goals should not be delimited by replication. Replicating for the sake of replicating will not bring benefits and will not be effective. Replication may not be the solution, but it may help bring the 'smartness' topic into the agenda of a city.

What the experience in Leipzig shows, is that replication was not the action that occurred during Triangulum. Access, rearrangements, changes, redefinition, exchange, learning, etc. occurred as part of a broader process, and technological solutions did not determine that.

Therefore, despite the recent efforts by the EC to hold working groups amongst SCC LC projects to exchange experiences on topics such as replication, this research proposes that it is also essential to recognize the value of knowledge gain as one of the main and key outcomes of such projects. Instead of focusing on replicating specific solutions amongst cities within projects, the EC should focus on using the favourable settings created by these projects to strengthen the competencies of FC to become smart. Moreover, it suggests to dissociate from the terminology replication and redefine what the real process is, balancing the expectation that the terminology could bring. That might be more profitable for the process and the actors involved.

The moment is opportune for this reflection since the projects from the first call of the SCC LC programme are close to conclusion and the evaluation of the actual outcomes of these projects can contribute with valuable insights. On the positive side, these projects might provide detailed sources of data that can generate in-depth understandings for European cities.

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