

Smart Cities in Metropolitan Regions – Analyzing strategies and funding schemes in the Ruhr area, Germany¹

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Abstract

Public policy decision-makers of metropolitan regions around the world are dealing with new needs in health, transportation, administration, and environment in the light of pandemics, climate change and digitalization. One answer to these increased challenges is that cities turn into smart cities. At the same time, it can be stated that the approach of smart cities alone is not sufficient but should be expanded to include the perspective of smart regions.

The explorative study investigates the biggest metropolitan region in Germany – the Ruhr area – and its development in recent years to create various smart cities and asks for its development into a smart region. We first identify crucial cases within the Ruhr area with special interest on cooperation and funding as this seem to be two necessary conditions for smart regions. Second, we analyze our expert interviews with four city CDOs to find out what role a smart region, as opposed to a smart city, plays for the cities in the Ruhr region. Overall, we conclude a) that the rise of different smart cities initiatives in the Ruhr area is not enough to form a holistic smart metropolitan area but b) the cities form smart regions outside the geographic context by setting up networks of cooperation.

Keywords: smart city, smart region, digitalization, metropolitan regions, cooperation, funding schemes, Ruhr area

1. Introduction

In recent years, cities around the world have begun to evolve into smart cities in the context of digitalization. By doing so cities themselves become part of their own technology and

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innovation policy. Instead of designing and implementing policies to enhance the local knowledge economy, the cities, their administration and finally their policy decision-makers are themselves affected by the technological innovation process. On the one hand, the goal of a smart city is to overcome given challenges, for example, by becoming more efficient, more ecological, or more socially inclusive with the help of new technologies in a unified concept. On the other hand, smart city projects lead to new challenges. In the Ruhr area, Germany's largest metropolitan region, smart city development is progressing accordingly. With a population of more than 5 million, the Ruhr area includes eleven cities and four districts that are geographically very close to each other and share city borders (RVR 2023). The cities share not only the geographical proximity to each other but also a common history which started already during industrialization and therefore common challenges until today. This aspect raises the idea of individual cities joining together to form a smart region. One of the challenges we see in the Ruhr area is that there is no real communication at the regional level. Although the cities are geographically very close, they are at completely different points in their smart city journey.

Another challenge both the cities and the region are facing is the financial resources which are needed for transforming historically grown cities and well-established city administrations into smart cities. As most of the cities in the region are regarded as relatively poor cities, they depend on external funding opportunities. In general, those funding opportunities exist on different federal levels but tend to focus on cities rather than whole metropolitan regions. This leads to the fact that cities of one metropolitan region compete for the same funding. Against this backdrop we examine the development of smart cities in the Ruhr area in this explorative study to answer the question: What role does the idea of a *smart region* play for the cities in the Ruhr area?

To answer that question, we conducted semi-structure expert interviews with four cities of the Ruhr area. A previous analysis of policy documents of eight Ruhr area cities suggested that the question of the smart region can be approached through the concepts of cooperation and funding. On the one hand, the extent to which cooperation took place beyond the city's own borders was analyzed. On the other hand, it was examined to what extent funding corresponds to or contradicts the idea of the smart region.

In chapter 2 we will first provide an overview of the development of the concepts “smart city” and “smart region” as well as the fundamental significance of funding for those concepts. Afterwards, we will present main characteristics of our research area – the Ruhr area and define our casing and method for this project. In chapter 4 we will present the analysis of our main material – the expert interviews and finally discuss our results regarding our research question.

2. From Smart Cities to Smart Regions

In this section, we briefly review the literature on the evolution of smart cities into smart regions and recall the most common perspectives so far.

Alexander (1965) first coined and introduced the term "Artificial City" to describe the idea that would later become smart cities (Hendawy and Kormann da Silva, in press). This concept includes "Cities and parts of cities which have been deliberately created by designers and planners" (Alexander 1965, p. 152); as opposed to cities that "have arisen more or less spontaneously over many, many years" (ibid.). It was not until the 1990s that the term smart city, as we know it today, emerged, emphasizing the role of new technologies in relation to urban infrastructure and environments (Albino et al. 2015).

In the context of governance and the reorganization of metropolitan areas (Brenner, 2014; Soja, 2000), cities are treated as a challenge to specify. It has become clear that cities can no longer be considered as separate entities (Amin & Thrift, 2002). In fact, cities are "regionalized" (Brenner & Schmid, 2015; Soja, 2000 in Matern et al, 2020, p. 2061) and shaped by heterogeneity (Sieverts, 2003; Young & Keil, 2010). According to Matern et al. (2020, p. 2061), this way of thinking about cities "is also relevant in view of smart cities", while ignoring the interconnectedness of urban and rural areas is inherently "against the backdrop of digitalization" (Matern et al., 2020, p. 2062). This understanding of physical spaces is directly linked to the development of virtual spaces, which are connected by systems of ICT networks and nodes that cross administrative boundaries and affect economic, social and spatial aspects (Sepe 2013). Nevertheless, research on smart cities mostly neglects this broader understanding of space and concentrates on the examination of administratively bounded urban areas (Russo et al., 2016, see also Morandi et al., 2016).

Recently, Hendawy and Kormann da Silva (in press) show that the conceptions on smart cities have shifted over the years from being traditionally techno-centric (i.e., Alexander, 1965; Hepworth, 1987) to being socio-centric (i.e., Pye, 2017) and, since 2013, to socio-technical/hybrid conceptions (i.e., Carvalho, 2014; Matern et al., 2020). Looking at the shifts that have taken place in the discussion on smart cities and, at the same time, the emergence of the discussion on smart regions, we can postulate that the hybrid conceptions on smart cities can be linked to the need to broaden the focus of smart cities to be addressed from broader scales and geographical foci (i.e., smart regions, smart rural regions). This shows the turn towards a hybrid smart integration at the regional level.

This turn can be traced back to the 2010s, when a discussion on smart regions first emerged with the work of Morandi et al. (2013); Rete Consultiva per Milano Glocal City (2013). Rete Consultiva per Milano Glocal City (2013) shows the shift from a smart city focus to a smart city-region focus, which is "brought about by paying particular attention not only to the main urban centers, but also and especially to the peri-urban and intra-urban areas, and consequently by remedying their marginality with respect to the stronger nodes" (Morandi et al. 2013, p.27 cited in Morandi et al., 2016). Nevertheless, Lyshchikova et al. (2019) postulate that the shift towards discussing smart regions emerged in 2016, when EU participants of the "SmartRegions" conference in Brussels shared their experiences regarding the development of regional and national "smart specialization strategies" (Lyshchikova et al. 2019, p.1340). These strategies aimed at providing strategic frameworks regarding innovative transformations in the "economies of European regions". Moreover, these strategies aimed at identifying the main priority areas for investment (i.e., "the distribution of digital technologies, circular economy, as well as industrial and agricultural modernization based on smart solutions"). Later, Tonar I and Talton (2018) published their article advocating the "need to stop talking about smart cities and start building smart regions".

According to Matern et al (2020, p. 2061), the term smart region has been "introduced in debates about digitalization in spatial development, although it is rather fuzzy and lacks a clear definition" (Caragliu et al., 2011; Giffinger et al., 2007; Greco & Cresta, 2017). The work of Matern et al. 2020, started to provide suggestions for territorial cohesion generating a theoretical conception of smart regions through connecting the discussions on the processes of hybridization and peripheralizations to smart regions. Earlier literature on smartening on the scale of regions is linked to the discussions on other related topics such as: smart territories (D'Angelo et al, 2017; Garcia-Ayllon & Miralles, 2015; Tedim et al., 2016), smart land (Bonomi & Masiero 2014), smart countries (Wiechmann & Terfrüchte, 2017), and digital villages (Entwicklungsagentur Rheinland-Pfalz e.V., 2018; Fennell et al., 2018).

After investigating the previously scattered work on smart regions Matern et al (2020, p.) defined smart regions as:

"diverse urban-rural areas that are spatially reframed by digital technologies and the respective social practices in a variety of fields (citizenship, governance, economy, environment, mobility, infrastructure) on a discursive, implemental and regulative level. The concept of smart regions follows a relational and social constructivist understanding of spaces and emphasizes an integrated approach towards the social (re-)construction of smart regions by actors and their networks".

With this definition of smart regions, they assert that a thorough analysis of smart regions requires a "broad understanding of a region," as strategic approaches are needed to address the challenges posed by digital transformations in a variety of spatial contexts. For this reason, they sought to adopt a relational perspective of space in their definition (Giddens, 1997; Löw, 2016; Werlen, 2017). This is the view that we adopt in our article.

From another point of view, Morandi et al (2016, p.93) assert that "a smart region should be considered not only in its overall extension [...] but also in relation to its individual components [...]. Because one of the main features of a smart region can therefore be identified in the multi-scalarity of its smart elements, the analysis of the case studies moves through three different steps". Accordingly, to select case studies in this view, different scales (local, urban and regional) need to be considered.

Currently, economic perspectives strongly influence the current research on smart regions by emphasizing growth, innovation and policy strategies (Calzada, 2013; Camagni & Capello, 2013; Greco & Cresta, 2017; Parada, 2017; Priano et al., 2016). In particular, the focus is on how digitalization and technological innovation can support and develop service delivery in regions. However, other issues, such as behavioral issues, participation strategies, and urban-rural interrelationships, are still largely unaddressed (Matern et al., 2020). This is where this article comes in, linking the topics of smart city and smart region as well as the importance of cooperation and financing using the example of the Ruhr area in Germany.

3. Casing and Method

The Ruhr area is a loosely defined region in the state of North Rhine-Westphalia in Germany. While its borders are not legally defined, it can be better described as a geographical area that shares a common history and therefore can be used as a reference for identity to this day (Korte & Dinter 2019: 5). Industrialization was key to the development of the region, as mining and its subsequent industry settled between the Rhine and Ruhr rivers (Cziera 2019). Another identity-forming factor is closely linked to economic development: The Ruhr region has experienced migration for centuries and is now known for its cultural heterogeneity (Dege 1969: 46; Dinter 2019: 32). Just as industrialization contributed to the region's rise, structural change since the closure of the last mines has been challenging the cities for decades (Bogumil & Heinze 2019). Nevertheless, the Ruhr region is one of the most densely populated regions in Europe, with more than five million people living in an area of 4,400 square kilometers (RVR 2021, p. 3).

Since there is no valid definition of the Ruhr area, we use the definition of the regional association, which counts eleven independent cities and four districts as the Ruhr area. Accordingly, our base population is represented by these eleven cities. Figure 1 gives an overview of these cities and their locations (RVR 2021, p. 1).



Figure 1: Overview of the Ruhr Area using the RVR definition (own adaptation using RVR 2023)

As a first step, we conducted a comprehensive survey of publicly known smart city proposals for the region. Therefore, we looked for already published smart city strategy documents or at least policy documents that could be considered as preliminary stages or announcements of strategies. This step led us to a selection of eight cities from our base population of eleven. We then took a closer look at the funding situation of the cities, which led us to focus on Bochum, Dortmund, Gelsenkirchen, and Oberhausen, all of which received external funding from either the European, federal, or state level. So, these four cities initially represented our criteria-driven selection.

Based on these steps, we asked all Chief Digital Officers or comparable positions for an expert interview. We were able to collect three of these interviews, and one of the experts recommended that we investigate the city of Herne, as they also applied for external funding but were not considered. The interviews with Bochum, Dortmund, Herne, and Oberhausen were conducted online using Zoom software between April and May 2023. The interviews

lasted 30 to 45 minutes and were always conducted by the same two interviewers using the semi-structured interview method.

Subsequently, the interviews were transcribed in a first step with the help of a software, followed by a manual correction. The interviews were analyzed by means of a structuring qualitative content analysis proposed by Kuckartz (2018) using MAXQDA 2022 (VERBI GmbH). Structuring qualitative content analysis was particularly suitable because the focus was on identifying themes and subtopics related to cooperation and funding in the four cities analyzed, as well as their systematization and possible interrelationships. The minimum coding unit was one sentence. The use of more than one code per unit was allowed. Based on the interview guidelines and in accordance with the research questions, only a few main categories were formed a priori. During an initial coding of the entire material, further categories and subcategories were identified inductively. Concept-driven categories as main categories were combined with data-driven categories as subcategories (Schreier 2014). This process was repeated several times until a differentiated system of categories was formed, structured by thematic categories. As we will be adding more interviews in the near future, the following analysis has to be considered as preliminary results.

4. Results

4.1 Cooperation

The results on cooperation are presented according to the levels of cooperation (4.1.1), the nature of cooperations (4.1.2) and general statements, needs and demands in the context of smart region (4.1.3).

4.1.1 Levels of cooperation

There are cooperations on three different levels: a) within the Ruhr Area, b) within Germany and c) internationally (EU).

a) Within the Ruhr area, the cooperation between cities B, C and D is often mentioned. This is because they are all part of the Smart Cities Model Project (MPSC), in which municipalities receive funding from the federal government. The requirement for this funding is to "exchange ideas with other cities, share best practices and transfer knowledge" and to support non-funded municipalities (City D: 15). An example of an "intensive exchange" (City C: 15) between an MPSC city and a non-funded municipality is that between City C and City A.

Sometimes cities work together in the application process for funding. For example, City D describes how it and another city "showed each other the ropes" (City D: 36) in the application process.

b) The MPSC links not only cities within the Ruhr area, but also cities in other parts of Germany. City D mentions that they are not only looking at cities in the Ruhr area, but also at large cities such as Hamburg (City D: 22f). City A, City B and City C also cooperate with other cities within Germany (City A: 12, City B: 28, City C:15).

c) The one city that does not have federal funding, City A, is instead part of a EU Innovation Hub (s. 4.1.2), through which it has international cooperations that are limited to the EU. They report collaborations with cities in the Netherlands, Greece, Spain and Italy (City A: 8. 10).

We can conclude that concrete cooperation is reported within the Ruhr Area, within Germany and internationally. The cities that are part of the MPSC are more connected to cities in the Ruhr area and Germany, while City A, as the only city interviewed that is not part of the MPSC, seems to be freer in its search for funding and cooperation partners in terms of the geographical dimension. It also became clear that cooperation is motivated by the need to overcome challenges, such as applying for funding or sharing best practices. The following chapter takes up this observation and examines the nature of the cooperations in more detail.

4.1.2 Nature of cooperations

This chapter examines the nature of cooperation, focusing on a) whether cities share technology or data, platforms or solutions, and b) the different types of networks.

a) City D reports that its public utilities are communicating with other public utilities in the Ruhr area about the spread of LoRaWAN as an Internet of Things (IoT) network. The idea is to see "if the networks, where they overlap, can be mutually used at the city borders in order to have a stronger penetration also in peripheral areas" (City D: 19). This is also linked to the idea of making travel data available to each other (City D: 21).

In Germany, 17 municipalities are working together on a smart city application – the "Open Smart City App" (OSCA). City B reports that they started with three municipalities and then grew because they promoted it in the municipal network (City B: 30). They first tried to develop the app with Deutsche Telekom AG, but their business model was too restrictive, so they started their own app development with different cities in Germany. The idea was that all city apps should be built on the same "foundation or use the same basis to ensure that what we generate in terms of data can then be made available to these apps as easily as possible"

(City C: 17). City D, who joined this project at a later stage, explains that "the app somehow needs a basic framework, and we develop the basic framework together. And then when you develop module XY, we make that available to each other and we use the app as a platform [...]" (City D: 46).

City A reports to be part of the municipal umbrella organization for e-government services in North Rhine-Westphalia, through which they can make use of "one for all services" connected to the data centers in Recklinghausen and Gelsenkirchen. The idea is to "divide up the sectors a little, coordinate them and then, ideally, give them all a focus" (City A: 12). City D also uses open data portals and "one for all services" (City D: 25).

At the international level, City A has a concrete project with cities in Italy, Greece, and Lithuania to develop so-called high-availability datasets so that AI such as Chat GPT can be applied (City A: 10, 18). To do this, they need big data and are working with research partners and the three cities.

b) Before considering the official network, we would like to mention that there are other networks that cannot be strictly separated from the joint work on technologies. For example, there is the so-called OSCA community around the development of OSCA with several cities all over Germany (City D: 17). Informal networks are also mentioned and described as follows: "You always have people you get along with better. Maybe you went out for a beer with them after an event and then you just call them up and talk to them. What's going on? [...]" (City D: 30).

The official network of the MPSC funding includes the idea that the funded cities exchange information and organize themselves as a unit with common experiences and different work priorities. If a city has already done the project, it shares its information and experience with the other cities (City B, 30). The different MPSC cities describe themselves as "very intensively networked" (City B, 8) and as "a very, very strong community" (City C: 21). Often, they are not funded individually, but together with another city. Such funding partnership is described as: "We did not start as an individual city [...] our exchange is very, very intensive because we simply have the...framework condition that we have to implement projects together in our cooperation" (City B, 12). Thus, it seems that the MPSC Community is strengthening the cooperation within the Ruhr area and within the cities of Germany. However, it must be emphasized that although a requirement for funding is to support non-funded cities, the apparently largest exchange takes place within the network of funded cities. This could be the reason why the network dynamics in the non-funded city of City A look quite different.

City A, together with universities and companies, has founded the association "Ideas Forum", which is part of the EU FIWARE Innovation Hub (iHub) (City A, 2). The FIWARE iHubs are designed to strengthen collaboration and co-creation, research and knowledge transfer, and technology transfer. The FIWARE Foundation for IT-Architecture of Smart Cities is one of the three main bodies in the EU for digitalization, along with the International Data Spaces Association (IDSA), which deals with data spaces, and the Gaia-X initiative, which deals with cloud infrastructure (City A, 10). As a FIWARE iHub, City A is connected to cities in several countries in Germany and the EU (ibid.). All smart cities meet every three months to discuss their strategies online. Once a year they meet in person for the Global Summit (City A: 18).

4.1.3 Smart Region: General statements, needs and demands

The focus of this section is on how the surveyed cities think about the idea of a smart region and what demands and needs they articulate in the context of forming a smart region.

All of the cities interviewed are aware that being part of the Ruhr area has its own special characteristics, such as geographical proximity (City B: 14, City D: 21) which leads to the conclusion that *especially* the smart cities in this metropolitan region must work together (City C:13, City D:23). These assessments are supported by the results presented in the previous chapter, where we saw that there are many close cooperations between some of the Ruhr cities. And even City A, which was a little out of the ordinary with its focus on international cooperation, claims: "I still dream of development partnerships on a large scale in the Ruhr area" (City A: 12). City B calls for the formation of a "smart city region" (City B: 14), understood as a "joint smart city network" (ibid.).

In this context, the question arises as to what is meant by a smart city region and what needs and demands are connected to it. One "huge topic" (City B: 14) in the smart city process, which is important for the idea of a smart region, is how to deal with large amounts of data. All four cities interviewed mention that it doesn't make sense for each city to create its own data silo - instead, there is a need or at least an idea to "connect the individual cities with each other in terms of data technology" (City B: 14) and to "work with other cities on the data platform" (City D: 25). A "stable data infrastructure or infrastructural basis" (City C: 11) is essential for the sustainable implementation of any kind of project within the smart city.

City A points out that a large-scale partnership is not possible in the Ruhr area "because we don't have a fixed umbrella organization in the Ruhr area, like Regio-IT for Cologne, Aachen or something like that. Unfortunately, this is lacking in the Ruhr area. In my opinion, this is a weakness" (City A: 12). Instead, City A demands that in order to strengthen the metropolitan

region, standards must be defined from the top and shared services must be introduced (City A: 16, 28). Otherwise, "a lot of money will be pumped into an area that is not standardized" (ibid.) and therefore not sustainable in the end. The need and demand for standards is highly relevant, as it is not only about strengthening a smart region, but also about keeping the individual smart cities operational and the digitalization process going in the future. City A describes a future problem as follows:

"If we continue as we have been doing and do not rely on open source, standards and unified structures and development partnerships, then by 2035, 2040, digitalization and the smart city will ultimately cause a huge problem, namely that more than 1/3 of the budgets, the municipal financial budgets, I mean, will be tied up in external services, for the operation and maintenance of networks, sensors and so on. Because a) we don't have the competence ourselves and b) at some point replacement procurement and replacement investment will be necessary. (City A: 30)

In summary, the need and demand for a strong Smart Region is articulated in terms of having standards and uniform structures, development partnerships, and relying on open source. However, this also means to acquire the necessary competencies oneself - at least as a region or community - and not to be dependent on third party providers. City D and City C also share the concern of falling into such a dependency (City D: 46, City C: 11).

City A explains that the standards are not only missing within the Ruhr area but also on higher levels such as that of the federal state of NRW (City A: 149) or Germany (City A, 28). This could lead to the following scenario: The "worst thing would be that, from my point of view, many things have been developed, many great initiatives have existed, many things have been financed by taxpayers' money, but they are not transferable" (City A: 28). This shift illustrates that it is not per se about the Ruhr area, instead it would be from relevance to have standards on higher levels.

City A has found the following solution to that problem:

"And most of the cities, because I have at least an overview of 60 or 70 municipalities in North Rhine-Westphalia that I've had as guests. They don't even know where to look. We know that now. We are looking in the direction of the EU. That's it. Standards are defined there. Reference architectures are defined there. There is the ETSI² and so on." (City A: 28)

² ETSI is a non-profit organization, recognized by the European Union as the European Organization for Standardization, with the aim of creating globally applicable standards for information and communication technologies (c.f. Bundesnetzagentur 2023).

We can summarize that there is a big demand for forming regions in the sense that standards must be defined in large areas such as on the Ruhr area level, the federal state NRW or Germany. However, this requirement seems to have already been met at EU level.

4.2 Funding

The following section contains results regarding the importance of the funding situation for cities, looking at their general perspective, external funding which in Germany always originates from a certain political level and internal funding which addresses the respective municipal budget.

4.2.1 General statements about funding situations

It can be stated that all interviewed city experts made claims about their general view towards financing issues and funding situations of cities where two issues were striking: In general, all cities acknowledged the need for financial resources to implement smart city projects especially as they regard these projects as basic infrastructural initiatives which were overlooked during the last decades (City D: 48, City A: 20). Additionally, two cities stressed that beside the financial resources human resources play an immense important role, but the sustainable financing of jobs is challenging for the city administrations and the initiative for a funding application often depends on individuals and their commitment – stressing how important single persons can be for smart city initiatives (City B: 35, City C: 20).

“... and whether there is of course the first employee who says "Come, I'll sit down there. I'll try to write down a sketch there." (City B: 28)

One point of view can be marked as strikingly different: City A is opposed to the often described procedure in which cities write concepts and use them to apply for funding. Here, City A tries to seek a mode that works the other way round: “And we've turned the tables: I no longer look at "What do I have to do to get funding?" Instead, we've turned the tables and said, "We have a strategy, we have projects, we have measures, and we're also putting our own money in our hands. And if we have the chance, something will come along the way." And it's usually now that they say "Hey cool, I read that...we'd love to fund that."” (City 1: 22).

4.2.2 External Funding

As 3 of our 4 examined cities are part of a funding program at the federal level, it is not surprising that this level was mentioned most often in our interviews. City B, C and D are all part of the “Smart Cities Model Project” (MPSC) funding program initiated by the federal government and currently housed in the Federal Ministry of Housing, Urban Development, and Construction. Since 2019, this financial support has so far comprised three seasons with a total funding volume of 820 million euros. As the results of 4.1 have shown, the program is not only about funding, but also offers and requires networking activities. Cities are committed to making their smart city projects available to others. During the interviews, it became clear that the cities accept this requirement in principle and show great commitment to networking in general although it requires a lot of work (City C: 35). However, the transfer to other cities is not always possible, especially if the funding is used for certain infrastructure that is unique: “That may be exemplary, or it certainly is, but we can't just take everything that we develop there and put it into a direct subsequent use.” (City D: 46).

When it comes to evaluating external funding programs, positive and negative statements are balanced. The programs are especially evaluated positively for giving the cities some kind of free space on the one hand side to invest in much needed infrastructure and thus supporting the often-strained budgetary situation. And on the other hand, to experiment with new ideas (City B: 24; City C: 27). The negative evaluations of funding schemes often referred to “what could go possibly wrong”. Here it seemed that the experts tend to be critical about the sustainability of those programs respectively warned that it needs to be ensured by the cities not only to use the funding for “super fancy projects” (City D: 32). One city was especially critical upon funding programs mainly for two reasons: 1) Potential misdirection, since the programs always address only individual topics, but rarely the entire urban development (City A: 20). And 2) missing structural funding and instead investing only in selected lighthouses (City A: 24).

4.2.3 Internal Funding

Internal funding is a category we set up during the analysis of our interviews as it turned out that our experts often referred to internal funding as a kind of antagonist or addition to external funding. Important for the case of the Ruhr area is, that most cities know weak budgetary situations either in the past years or until today due to challenges of the structural change within the last decades (City A: 20). Again, two points were especially striking here, one more strategic and one more in terms of operational management: The topic of internal funding shows the connection between administration and politics. Whereas the initiative for

applications for external funding mostly is topic for the city administration the internal funding situation is part of the negotiations in the city council and therefore political (City D: 40).

Furthermore, it shows that again human resources play an important role here as the cities set up different employment conditions reaching from positions that are only created for the period of external funding to integrated finance concepts that already consider future costs for additional personnel costs for the internal budget (City D: 42, City C: 27).

5. Conclusion and Discussion

In this paper, we conducted interviews with four cities in the Ruhr area to gain insights into the idea of a smart region as reflected in the concepts of cooperation and funding.

We can summarize that cooperation plays an important role in digitalization and the process of becoming a smart city (4.1). There is cooperation between cities within the Ruhr area, within Germany and on an EU level. The cooperations take the form of knowledge exchange, technology sharing and networking through official networks such as the MPSC or the FIWARE iHub. In addition, it became clear that funding schemes enable and support cooperation between cities in the sense that they form networks, require networking and generate close cooperation by funding cities together (4.2).

Regarding the idea of a smart region, several aspects can be articulated:

First of all, it can be said that the Ruhr area is still thought of in terms of individual smart cities rather than a smart region. One example is the cooperation on the Open Smart City App (OSCA). The cities are working together on a framework with different modules for apps. But even though the cities are talking about a common app, it is still about each city having its own app. The idea of having an app for the whole region - a "Smart Region App" - is not being considered so far.

Instead, the idea of a smart region gets attention in another context: There are several attempts reported to provide data to each other, e. g., through OSCA, all-for-one services and highly available datasets etc. (s. 4.1.2). However, these attempts are far from being sufficient (s. 4.1.3). Exactly at this point the demand for a smart region arises. The idea of a smart region is clearly connected to the demand of cross-city standards, uniform structures, development partnerships, open source, and interdependence from third party providers as a self-sufficient region. The main idea is to make digital innovations transferable and sustainable. Cities cannot meet these criteria alone. They need to form a region. Thus, the demand for a smart region is based on the realization that certain challenges of digitalization cannot be met on their own.

The concept of external funding is connected to the demand for transferability, sustainability, and the need for a region. One of the concerns expressed is that huge amounts of taxpayers' money are being pumped into specific areas, and after a few years they are no longer useful. What is needed is something like structural funding that supports the whole region, not just individual cities. Since external funding always comes from a certain political level, there is no institution at the regional level so far that is backed up with enough resources to support the Ruhr area. Although the region has its own regional association this one is not powerful enough to provide budget that could be used for intercity or regional projects.

This brings us to the final aspect of smart regions. A smart region can be thought of as consisting of the cities in the Ruhr area, as the surveyed cities emphasized that the high density of this metropolitan area introduces this idea. However, it also became clear that it doesn't have to be thought in terms of geographical proximity. The cities know that in and through digitalization it is possible to work independently of time and place. This is why the need for standards at higher levels, such as federal or national, has been expressed and cooperations on an EU level have been reported. The fact that such standards already exist and are used at the EU level raises the question of the extent to which the lack of standards at the national level is a problem. As already described in Chapter 2, the research on smart cities and regions mostly neglects a broader understanding of space by concentrating on administratively bounded urban areas (Russo et al., 2016, Morandi et al. 2016). In contrast, we see very clear indications that the smart cities themselves understand smart region in a broader geographically more flexible way which shows the need to shift the research focus and further investigate in this development.

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