Smart Region concept as a solution for sustainable development for region with a rural and urban character

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Abstract. This paper is aimed to describe a smart region as not only a set of technological tools and solutions but as network system of people living in a region, their quality of living, communication, government, infrastructure, transport, economy, science, technology etc. The model region Salzland demonstrates that smart-decisions are required today first of all in mixed (urban and rural) areas to equalise the existing city-rural divide and to secure the future of the rural areas. The study provides strong evidence that despite different initial and basic conditions, all smart initiatives are aimed to the similar thing – the improvement of existing systems and structures in the considered space, whether million metropolis or thinly populated rural region.

1. Introduction

Problematics of “smart” space has recently become the subject of numerous publications. This is largely due to the rapid development of digital technologies: software, multi-media, etc. In fact, there has emerged a new ideology of the future based on an understanding of the role of digital communications and the development of the economy on digital technologies. From a practical standpoint, the greatest attention is paid to the conceptual realizing and practical implementation of the smart buildings and smart cities projects because of their greatest practical effect [1, 2, 3, 4, 5, 6, 7].

Therefore, terms smart city, smart region, smart spaces, and smart society are becoming more and more popular in the modern changing world. But what is to understand under all these terms? Technology, communication, innovation, government, infrastructure, transport, economy, natural resources, society, quality of living, science etc. are the features that could be used to define smart city, smart region or smart space. According to [3], there is no unique and standardized definition of a smart city, although some are started to be proposed; the same is true for the term smart region. It should be noted that the most researchers agrees that smart region now is something more than just big data, technological connections and efficiency; it is also creating an interpersonal relations between a region and its people [1, 2, 3, 4, 5, 6, 7]. R. Sutriadi [4] classified smart cities literature in four groups
This paper aims to study the cross-country experience, possibilities and prospects of implementing smart technologies in a small non-urban region.

2. The model region Salzland

The district Salzland is a part of one of five physical planning regions in the state Saxony-Anhalt. The central location of Salzland, between conurbations of Magdeburg and Halle, as well as good connection to supra-regional transport infrastructure favour its location. In the current form the district Salzland exists since 01.07.2007, its area makes 1.426 km² and population counts 193.574 inhabitants (30.06.2017), so the density amounts 136 people/km². The district is mostly a rural region where 75% of area are used for agriculture. Other 25% are divided between settlements and transport areas as well as forests and basins. The district's capital Bernburg is famous for its “five white powders” because of production of salt, soda and cement as well as sugar and flour (near the city). The landscapes and historical heritage make the district attractive for tourists.

In the entire state of Saxony-Anhalt, this district was worst affected by demographic transition, which resulted in qualitative and quantitative changes noticeable right now. This transition will lend the future of the district Salzland. The population in many places will shrink somewhere probably up to critical point of viability for single offerings to provide the basic requirements. The provision of these offerings becomes much more difficult but it is important for future decision of people to stay in this rural region. Figure 1 shows the demographic situation in 2017 and a prognosis to the year 2030.

![Figure 1. Demographic situation in the district Salzland.](image-url)

The district Salzland faces all these challenges, it would like to accept responsibility, and thus investigates in different projects creative, applicable ideas, approaches and possible solutions to be able to secure the future of the rural areas. That is the reason why for several years the innovative initiatives have been started and filled with life, the projects are developed with and for people and
implemented together. The district Salzland would like to develop its future by itself more active.

What the cooperation enables, shows this actual example. The district administration, the service provider of local public transport, two municipalities and the mobile nursing service are searching together for ways to enhance the mobility of everyone in this rural area by intending to share current resources with each other. This significantly enhances the accessibility of medical care, local supply and local public transport for each village. Travelling from remote villages to single service, even with a personal car, is partly a very long way today.

The district Salzland consists of people. Administration and communal facilities play the role of services that takes care of functioning the streets and working the power lines, of mobility of people or of appropriate use of hospitals and schools. Topics and interdisciplinary cooperation contribute to the selforganisation of people. Here new technical aids can support to create increased values for all participants in many areas of public life due to increase of automatic digital data exchange. New digital techniques are changing today power supplies and mains, administration work, transport and economy.

Therefore, a central field of action on the way to the Smart Region for the district Salzland is the development of a holistically conceived information and communication infrastructure. A solution developed for the entire district is the important prerequisite for future "smarter" processes between the individual organizational units (e.g. transport, administration, schools, supply infrastructures). As a result an improved network integration of all regional actors optimizes in the future the interaction of all participants from many spheres.

3. Approach

3.1. Definition of a smart region

As it mentioned above, there is no unique definition of smart region. There are many possible variants depending upon the subjectivity of “lens” [3]. So R. Sutriadi defines smart region as an innovation of sustainable planning approach at the regional level that promotes knowledge-based development through the continuous learning of human resources as an integrative part of regional resource development, especially in encouraging harmonization between conservation and developable areas in the context of national development planning system. This leads to the effective and efficient regional development of economic sectors supported by appropriate technology to high technology as a result of continuous learning [4]. O. Kodym and J. Unucka describing the Moravian-Silesian Region as a smart region emphasized that there is a simplified definition of a smart region: such region employs modern technology to save time and money of people who live there [6]. We understand Smart Region as a region that solves tasks and challenges by wisely applying e.g. new technologies, by organizing processes otherwise or by making wise, future-proof decisions. As already mentioned, the future sustainable mobility must be completely rethought, the transport needed here to be organized in a different way than today, whether public or private.

The first practical results of these experiments are discussed in Russia [1, 2, 3, 8]. At the same time, it is obvious that all projects of territorial communities with the prefix "smart" are a special case of global projects at the state level which ensure to develop the general infrastructure of the whole country and without which all smart development projects will be impossible (electricity, Internet -networks, software, etc.) and to develop a management system based on the use of information and telecommunication technologies in the electronic implementation of state (municipal) authorities. Therefore, some scientists believe that smart technologies have provided a transition to a new stage of development of the information society which can be qualified as a smart society [1, 3, 5, 9].

Cities and regions will change furthermore in a future. A well thought-out use of digital possible solutions to network different actors can help configure the smarter but above all more worth living. When doing everything, it should always be in the foreground that we do not want to network technical systems and organizational structures with each other for their own sake, but that the core of our future efforts must always stay man and his needs for a fulfilling life, whether in the city or in rural areas.
3.2. Compliance with major policies and strategies

3.2.1. Europe 2020 Strategy, Partnership Agreement for the 2014–2020 Programming Period

Digital Agenda for Europe is described here briefly. The goal of the Europe 2020 Strategy [6, 7, 10] is to create a digital single market based on fast and ultra-fast Internet and interoperability of applications:

- by 2013: basic broadband coverage for all;
- by 2020: Next Generation Networks (NGN), 30 Mbps or more for all;
- by 2020: 50% of households having 100 Mbps subscriptions or higher.

The strategy of Innovation Union means:

- Focusing research, development, and innovation policy on the major challenges of the world today, i.e. climate change, energy industry, resource efficiency, healthcare, and demographic changes;
- Supporting each element of the innovation process, from basic research to product marketing.

3.2.2. Government policy in Germany

Germany’s Federal Government has been supporting Internet of Things and Services activities as part of its High-Tech Strategy since 2006. The High-Tech Strategy is a landmark policy program to bring key technology and innovation stakeholders together in a common purpose of developing new technologies. The objectives set out in the High-Tech Strategy were continued and extended within the framework of the "High-Tech Strategy 2020" launched in July 2010. Most programs within the framework of the High-Tech-Strategy promote partnership between different project partners – particularly enterprises and research institutes – in order to bring together institutional research and entrepreneurial expertise. The initiative combines the resources of all government ministries, setting billions of Euros aside annually for the development of cutting-edge technologies. Research and development projects can accordingly count on generous financial support in the form of grants.

The High-Tech Strategy 2020 exists to establish Germany as a lead provider of science and technology-based solutions in the fields of:

- Climate/Energy
- Health/Nutrition
- Mobility
- Security
- Communication

INDUSTRIE 4.0 (one of 10 “Future Projects” identified by the German government) is the name given to the German strategic initiative to establish Germany as a lead market and provider of advanced manufacturing solutions. According to the estimates, Germany has the ideal conditions to become a global leader in innovative, internet-based production technology and service provision. Technological leadership and vision in the fields of manufacturing, automation and software-based embedded systems, as well as historically strong industrial networks, lay the cornerstone for the long-term success of the INDUSTRIE 4.0 project [15]. Therefore, German experience could be a good basis for implementing smart initiatives in other countries and regions.

3.2.3. Government policy in Russia

The transition to the smart society stage in Russia is carried out on the basis of several government documents (strategies, concepts and programs), among them the most important are such documents as the Strategy for the Development of the Information Society in the Russian Federation for 2017-2030 (approved by Decree No. 203 of the President of the Russian Federation on 05.09.2017), the state programs "Information Society (2011-2020)" (approved by the Government of the Russian Federation on 20.10.2010) and "Digital Economy of the Russian Federation" (approved by the Government of the Russian Federation on 28.07.2017). It is significant that even the program "Information Society (2011-2020)" set the task to form e-regions and e-municipalities.

The state became the main investor into developing the information society. To realise the program «Information Society (2011-2020)», there were planned 2.6 trillion roubles from the federal budget, to
realise the program "Digital Economy of the Russian Federation" – 1.6 trillion roubles, among them 1.1 trillion roubles from the federal budget

It should be noted that the focus on the digitization of the country was represented even in the name of the enforcement authority on the federal level. Thus, there has appeared the Ministry of Digital Development, Communications and Mass Communications of the Russian Federation, the Ministry has a department for the development of a digital state whose activities are aimed at providing citizens and organizations access to priority public services and services in digital form, creating a national data management system, developing an electronic infrastructure governments, the implementing end-to-end platform solutions in state administration [11]. One the most important task of the Ministry is the formation of a unified engineering, information and telecommunication and computing infrastructure, including the creation, development and operation of subsystems of monitoring the data transmission network of the authorities, the system of federal and regional data processing centres (DPC System), the state unified cloud platform [12].

Thus, the state has taken upon itself the task of creating a common infrastructure for ICT, a common normative legal field governing the sphere of digital interactions in the state, training and developing areas of interaction between public authorities and the public. To a certain extent, state policy turned out to be forced since there is no time for accumulating funds in the business sphere for the gradual informatization and digitization of the environment. Geopolitical competition has become the main impetus for the accelerated development of the digital environment and digital production in the country.

Government policy is a condition for developing the regional and local information communities which can take place only if there are provided certain objective conditions (sufficient energy capacity, abundance of electronic devices, Internet availability, including Wi-Fi, population training, software availability, interconnection of public authorities services and management and business, etc.).

However, the state’s efforts to develop a smart society are clearly not enough. To become a source of technological and social progress, smart technologies must be energy efficient. But the practice indicates significant barriers to the successful promotion of energy-efficient smart solutions on the Russian market: institutional and legal; organizational and economic; scientific and technical; informational [13]. In EU and the USA, the state plays the leading role in regulating the development of energy efficiency and resource saving systems including the development and promotion of energy efficient smart solutions.

The Perm region has set for itself very ambitious task to become one of the leaders of Russian Federation in ICT sector development. There was adopted the Concept of the development of the digital economy of Perm region [14] which assumes that by 2024 the share of the ICT sector in the regional economy will almost double, and among the five main areas using of digital technologies in the public sector the following ones are highlighted: the public sector ("E-education", "E-health", "E-document flow", State services in electronic form", "Automation of financial processes - planning and accounting systems", etc.); complex implementation of “smart city” technologies in municipalities of the region (projects - “Smart City”, including the subprojects “Smart Transport”, “Smart Lighting”, “Smart Energy”, “Smart Water Supply”, etc.).

Since the Perm region has set for itself such ambitious task, it seems necessary to study the cross-country experience of market leaders, e.g. Germany and German non-urban regions.

3.2.4. The project Smart.Region Salzlandkreis

A lot of big cities worldwide have invested for many years into their endeavour to become smarter (or more intelligent) city. The topic to what extent the smart city decisions are suitable for regions is the subjects of many discussions on every continent [1, 3, 4, 7]. However, much attention is paid to conurbations or metropolitan areas but it is becoming clearer that “smart” decisions could be of use not only to reorganise the densely populated urban centres but to develop thinly populated regions by today's standards with the help of “smart” processes for solving the future tasks.

Despite different initial and basic conditions, all “smart” initiatives are aimed to the similar thing –
the improvement of existing systems and structures in the considered space, whether million metropolis or thinly populated rural region. We are talking about increased values for all due to synergy, cooperation, networking, and distribution. The new technologies where they can support are a connecting element and a driver for designing the future of a region. The use of "smart" digital technologies with the new definition of existing processes together with ones for organization and control creates possibilities for a completely new kind of collaboration between single organizations. Early participation processes increase the acceptance for the new and should be carried out as early as possible because without the willingness in thinking to question the previous nothing new arises.

For functioning the region, it is important to success that we test new ideas and approaches as well as learn continuously while working. Figure 2 presents the scheme of Smart.Region Salzlandkreis: economy/science/living interaction based on modern technologies and smart solutions.

Figure 2. Smart.Region Salzlandkreis.

The district Salzland is considered as a model region for implementing the new solution approaches. It would like to become a “test lab” for successful digital transformations in Germany and create in cooperation with its partners new space for both brainstorming and new projects. This should be spaces that promote a sustainable and smart development of the whole district to ensure the quality of living for all its inhabitants.

4. Actual implementation in the model region
The practice always shows how important for implementation of new ideas and approaches are intensive moderation, communication and participation of all target groups taking part in processes. After investing a lot of time in the first stage to define the image of „Smart Region.Salzlandkreis“ together with internal and external experts, the region is actively involved in the process in the second stage. In few years, the regional digitalization centre of Salzland will be developed into a thematic and
interdisciplinary junction for the region. Representatives from politics, administration, science, industry and society are directly invited to enter into a profitable exchange with the district administration.

In order to realize the first essential points of future action, a master plan Smart.Region Salzlandkreis is to be developed in the coming months to name visions, goals, opportunities and initiatives in the district Salzland and to maximize the benefits of digital activities for the region. This should be a reliable digital docking strategy for those who want to recognize and take responsibility. A plan should provide assistance for the digital transformation of society which helps to promote cross-thematic action and to overcome existing obstacles, boundaries and barriers between single organizational units.

By working together to develop a strategy that is shared by all parties involved, today we want to open up self-contained organizational units and cooperate better with each other in order to achieve a common line. The development of new business models for the cooperation of the municipal units in the district Salzland can be seen as an important result at the end of the process.

The district Salzland has been building technical infrastructures for some time to network single organisational units of the district with modern innovative information and communication technologies. Due to the project „IT macht Schule“, almost all schools in the district have been linked to the administration. Based on this experience, the next step will be to integrate the district's transport and business operations and the job centre into the existing IT landscape of the district. The creation of the conditions for access to a "smart" Salzland district system forms the technical backbone of all future developments towards the Smart.Region Salzlandkreis. There are currently about 60 access points in the communication network of the district, which makes it able to share data and information in a protected environment within this network.

At the same time, we search for ways to enable cities and municipalities, societies and associations as well as industry and the population to (co-)use these digital resources. Hereby this should increase the efficiency of the single municipalities and the modern exchange of information should also progress. A possible networking of data and information promotes cooperative actions, this is seen as a future driver of digital transformation in the district Salzland. In the age of digitization, geodata have developed into another driver of technical possibilities and have found their way into almost all sectors of society. In many places, you form appropriately prepared one of the foundations for strategic decision making geodata in politics, administration, science and business. Even in everyday life, geodata increasingly determine daily life. With increasing networking, the need for area-related information will become more important and accordingly increase. Without intensive use of area-related information it is difficult to imagine a functioning Smart City or Smart Region. Therefore, an important element in the development process Smart.Region Salzlandkreis is also the creation of preconditions for networking and exchanging the geodata of single organizations. The district Salzland is intensively preparing to initiate the establishment of a regional-based solution for (geo)data networking in the district in 2020, to create basic structures and to moderate the process with the participants. The aim is to continuously generate increased value for all participants through a joint area-related data strategy and to develop the required framework conditions in accordance with the requirements of the Geodata Infrastructure Act of the Land Saxony-Anhalt (GDIG LSA) [16].

A most important thing about a worth living and the future quality of life in district Salzland for the inhabitants is connected with mobility. Mobility is often understood not only as the mobility of people but also as the mobility of data, goods and services that can help people consciously decide to live in the rural area. Therefore, the district Salzland intends to develop the current mobility offers for his inhabitants by supporting "smart" solutions. At the moment, in cooperation with the federal government, local public transport mobility services are being examined for their feasibility (currently a take-with offer by a nursing service). Later we will look after the ways to help bring information offerings to the target group, to manage a wide range of mobility offerings, to make multimodal mobility chains in the region a reality, and to merge them into a complete system of local public transport of the district Salzland. The supportive use of geodata creates many new possibilities for the
implementation of innovative technical solutions. Figure 3 demonstrate the two-level model of information and communication mobility concept in Salzland.

2-Level Information and Communication Model Mobility in Salzland

![Figure 3. Two-level model of information and communication mobility concept.](image)

This model demonstrate the interaction of all participants of local public transport system. In order to enable people in the district Salzland to use and provide barrier-free access to individual mobility and care services in a Smart.Region Salzlandkreis, the “Salzlandkarte” (Salzland-card) is currently being developed in cooperation with regional and international business partners. The first project step will introduce a cashless payment system which will also be suitable in the future for using a mix of public mobility offers. The aim here is to enable a potential passenger to be transported without having to switch between different billing systems, regardless of the choice of public transport or destination, within the tariff zone of municipal service provider inside the district Salzland. After the successful introduction of the district's new payment system for public transport, the next step will be to examine in what way the existing processes for organizing district-wide pupils traffic can be improved with existing digital opportunities. With the Salzland-card it is possible not only to pay in the bus, it is also at the same time the ticket to identify a pupil on the reading device in the bus.

In the future, the Salzland-card is to be extended step by step with additional functions. It is planned to legitimize access to public facilities such as libraries, sports facilities and schools, as well as to facilitate payment transactions between service providers (e.g. food service, swimming pool),
teachers and pupils or parents in a more simplified way.

5. Prospect in the way to Smart.RegionSalzlandkreis
The district Salzland faces radical change processes. Developing suitable solutions to the ever-changing social, financial and technical conditions will be crucial for many people in rural areas, whether they stay here or not. New ideas and a regional awareness of responsibility need to be developed further and people behind them will be brought together for the benefit of the region and society. A "smart" networking across all levels between administration, business, knowledge, and citizens equalises the existing city-rural divide and thus can positively influence future processes. Considering the region as a complete system will create synergies for the benefit of many people in the future. With a sustainable project work and the sometimes longer-term support of projects, there are many opportunities to prepare the district Salzland for future challenges and thus to shape the region together with its inhabitants. A continuous exchange with the other regions in Germany promotes "seeing beyond the end of own nose".

Through digitization and networking, there are great opportunities for decentralized innovations and completely new perspectives in the development of the district's scientific, residential and business locations:

- for the education – from the kindergarten up to the university degree,
- for the local and basic supply – from the family doctor in the neighbourhood to the possibility to use services off the larger places in the district,
- for a best barrier-free mobility of people of all ages – from the centres to the village areas.

Therewith we are investing in securing the equal conditions in rural areas, avoiding further divergence between city and countryside and increasing attractiveness for all generations living in rural areas.

6. Conclusion
The paper indicates that smart region now is more than technological decisions and efficiency; it means also interpersonal relations between a region and its people and life quality. It is clear that this study can be a basis for future studies in the problematic of smart society. The developing model of promoting a small non-urban region as a smart one could be applied e.g. in the Perm region which has some similar problems. One limitation if this study is that we did not investigated the “technical” side of the problem but this could be a further research question related to the possibility of optimising technical, social, economical and political interaction. An overall strategy described extends far into the future, supra-regional and regional partners continue to network, it is interdisciplinary aimed to bundle the competencies of stakeholders and to sustainably and effectively follow the way to the digital society. An agile approach and regular coordination between the parties ensure that processes do not unintentionally become independent and that the developments can move too far away from the actual goals. The concept of a smart region is one of the ways to slow negative demographical trend and make life more attractive in smarter non-urban regions.

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