Smart Service Development in Public-Private Settings – Assessment Methodology and Use-Cases in the Lake Constance Region

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Abstract. Under headings like 'Smart Government' and 'Public Private Partnership' (PPP) - i.e. the development of services in cooperation with private, industrial service providers - municipalities are launching ICT and digitalisation initiatives aimed at the holistic deployment of digital, public and private smart services. Even where geographical proximity and similar socio-economic conditions of the municipalities are often present, a systematic exchange of methodologies, service design approaches, and best practices is missing. In this paper, we describe the how service science is approached in the public sector, especially in cooperation with private as well as academic partners and in co-creation settings (quadruple-helix). Furthermore, we present existing approaches in procurement and approaches we designed for service development in Smart Government and Smart Cities settings in the Lake Constance Region. Key Performance Indicators (KPI) and two use-cases of the region round of the paper.

Keywords: Smart Government, Smart Cities, Smart Service Development.

1 Introduction

1.1 Smart Cities, Smart Governments, and Smart Services

With the Europe 2020 strategy the European Commission has set numerous goals, which aim at achieving smart, inclusive and sustainable growth in Europe. At the core of Europe 2020 is the pursuit of innovation as the union's competitiveness is depending on innovative, holistic services and products. Hereby, the services and products in question have to tackle major societal challenges, including climate change, energy efficiency and emission reduction (*Smart Cities and Communities – European Innovation Partnership,* Communication C (2012) 4701 final). When looking at the Strategic Energy Technology (SET) Plan (Albino, 2015; Directorate General for Energy, 2018), we find that over 40 demonstration cities were planned until 2020, which are all supposed to accomplish ambitious goals. Similar to sustainability and green building challenges,

the ageing demographic in European countries is demanding unique approaches towards healthcare. Smart services and health care solutions are considered one opportunity to ease the burden on governments and cities, especially since the advent of new service fields that emerged under the consideration of new technologies – mainly ICT based – such as Smart Care for at-home care (Thomas et al., 2014) or Ambient Assisted Living (Sun et al., 2009).

Finally, services that are provided directly to citizens similarly undergo a transition towards more ICT based solutions. Smart identification services for citizens, such as the Schaffhausen eID+ (Kanton Schaffhausen, n.d.) in Switzerland or the e-ID (A-Trust, n.d.) in Austria are just some examples. It is especially noteworthy, that blockchain technologies in Smart ID use-cases are predestined for the development of multi-stakeholder, public-private ecosystems and services derived therefrom – ranging from services offered by municipalities like the provision of legal paperwork over services of private insurance and banking providers like credit score documentation to payment services in local shops.

Therefore, our research activities based upon the research project Smart Government Academy for the Lake Constance region aim at

- development of high-level requirements for innovative, integrated solutions in energy, health care, Smart ID, and ICT, both on business and policy level, thus enabling the derivation of meaningful frameworks and KPIs for Smart Government
- derivation and development of cooperation and recommendation frameworks for territorial knowledge, data-enabled services and entrepreneurship, extended by the development, acquisition and publication of a comprehensive KPI set, specifically targeting the needs of European regions as laid out by the high-level requirements and Smart Government assessment
- stimulation of the market for data-enabled services and products - thus supporting entrepreneurship and providing recommendations to policy makers for collecting new sources of data and form the basis for a Smart Government index.

1.2 Terminology and Previous Work

In order to create comparable KPIs and assessment methodologies for Smart Cities and Smart Government services, individual goals have to be broken down into their overall dimensions, high level goals and inherent technical dimensions - e.g. Smart ICT, blockchain, Big Data and the Internet of Things (IoT).

Best practices have to be interconnected with the performance measures for services, always accompanied by the scalability component of the practice. They can be categorised according to the characteristics present in the European Commission' study on Mapping Smart Cities in the EU (Manville, 2014): Smart Governance, Smart Economy, Smart Mobility, Smart Environment, Smart People and Smart Living.

2 Service development in PPP – Smart Cities and Smart Government

2.1 Smart Cities

A Smart City is a place, where "digital technologies translate into better public services for citizens, better use of resources and less impact on the environment" (Smart Mobility and Living (Unit H 5), 2020; Milenković et al., 2017). A key role in this respect is played by the management of large amounts of data as their "context-related analysis and combination (…) allows self-learning algorithms to make increasingly precise statements about certain facts, groups, or even single individuals, enabling the automation or execution of certain tasks in much more efficient and citizen-friendly ways" (Guenduez, 2018).

The technological focus may not distract from the holistic approach of smart cities, whose thematic fields might at times be "more social and organisational than technical, substantially associated with multiple diverse stakeholders and high levels of interdependence" (Pereira et al., 2017). A smart city is additionally about creating and fostering connection and interaction between its stakeholders (governments, scientific institutes, companies, citizens and NGOs – sometimes referred to as Quadruple-Helix of actors or Public Private People Partnership) in order to use their potential to find innovative solutions for complex problems.

2.2 Smart Government

Smart Government is a dimension in the overarching concept of a Smart City along others like smart economy, smart environment, smart living, smart mobility, and smart people (Purnomo et al., 2016). This also applies to the previously common notion of e-government that improves information, communication, and transaction processes between the government and all of its stakeholders (Schedler, 2013). A government that acts smart is characterised by "activities that creatively invest in emergent technologies coupled with innovative strategies to achieve more agile and resilient government structures and governance infrastructures" (Gil-Garcia et al., 2014). Moreover, it seeks to adopt an open style government which integrates "stakeholder participation and collaboration on all levels and in all branches of the governing process" (Scholl & Scholl, 2014), and generally turns "government tools from an office-centric mode to a citizen-centric mode" (Milenković et al., 2017). From a technological point of view the concept of smart government especially outlines the role of Big Data. The data is obtained using intelligent networks and smart objects which are equipped with sensors, actuators and a communication unit attached to an unambiguous identity on the Internet (Lucke & Große, 2017), thus can be "identified throughout its life and interact with the environment and other objects. Moreover, it can act in an intelligent way and independently under certain conditions" (González Garcia et al., 2017). Examples for smart objects range from wearables like mobile phones and smartwatches, smart-home-devices like motion detectors and automatic blinds, stationary devices like surveillance cameras /

intelligent street lighting, and mobile devices like drones and unmanned vehicles (Lucke, 2018). While the e-government "has been criticized for being largely focused on improving government services" (Hansson et al., 2018), a key aspect of a smart governments is its radical openness. Similarly, open data mends the traditional separation between public organizations and their stakeholders (Janssen et al., 2012).

A smart government acts not only as a producer and buyer of services, but also as a service innovator and promoter of an innovation ecosystem as it proactively provides a suitable environment for user-/business-driven and open innovation (Jussila et al., 2019). One example is the offering of prototyping environments to academic and industry partners (Ubaldi et al., 2019). Hereby, open data is used to "enable the public, entrepreneurs, and their own government programs to better leverage the richness of federal data through inputs into applications and services" (Pereira et al., 2017).

Innovation management for Smart Government within the context of this paper is understood as strategically moving into uncontested markets (e.g. Blue Ocean Strategy (Kim & Mauborgne, 2015)), formulation and documentation of goals and needs, as well as differentiation between innovation types (frugal innovation, pro-active innovation, high-speed/low-risk innovations and others) (Govindarajan & Trimble, 2010).

3 Indicators for Service Prototypes in the Public Sector

3.1 Technology Maturity and Key Performance Indicators

Performance measurement and KPI frameworks are set up to clearly quantify comparable, properly defined target values, which are meaningful to its intended audience as they need to drive towards the benefits that are expected to be delivered. In Smart Government, alongside the common policy goals, we have a broad range of stakeholders and intended audiences, depending on individual viewpoints, fields of expertise and area of operation. To this extent we include a set of components in our framework, shown in the Service Development Cube (Fig. 1). The multi-dimensionality is hereby broken down into its high-level dimensions. Firstly, the inherit pretension of Smart Government, namely the requirements of being smart, efficient, effective, sustainable and liveable. Secondly, the area of operation is taken into consideration. This includes transportation solutions - from public transport, inter-modal person transport and goods logistics -, Smart Care, citizen services and sustainability, as well as its supporting infrastructure. Finally, the dimension contains the context of its national and international policy frameworks, as well as its approach towards innovation and entrepreneurship. Lastly, the technological dimension rounds off the measurement cube, taking into account numerous ICTs from the necessary foundation, e.g. Big & and Open Data, or the Internet of Things, but also specialised technologies like Blockchain solutions, geo-information systems, open data, or inclusive web portals. With these dimensions we are laying out the preliminary groups of indicators, which then are enriched with specific internal and external stakeholders, assessment methodologies, value ranges and best-use scenarios (e.g. lead vs. lag indicators), as well as the linkage to scalable and targeted best-practices.

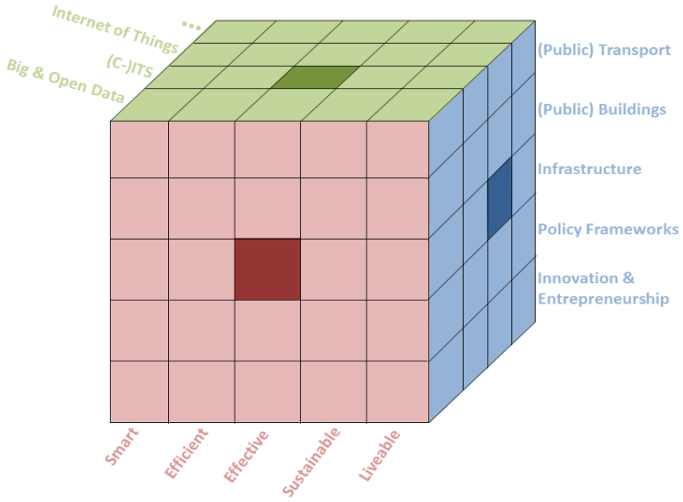

Fig. 1. High-level dimensions for performance measurement

The partnership between public authorities, private companies and citizens, i.e. Public Private People Partnership (PPPP), and their targeted innovations is the lowest level of the Service Development Cube and consequently the foundation upon which all other levels are built. Creating an economical sound broad-ranging ecosystem for PPPP is a significant challenge, which must incorporate public procurers, city and transport planners, policy makers, citizens, technology providers and the companies taking the entrepreneurial risk to create pioneering and innovative solutions. The approaches KPIs are therefore setting the measurement and comparability of entrepreneurial support and innovation as a key component of its analysis, and tracks time-to-market, cost-to-market, fitness for market, and novelties for the market (Fig. 2).

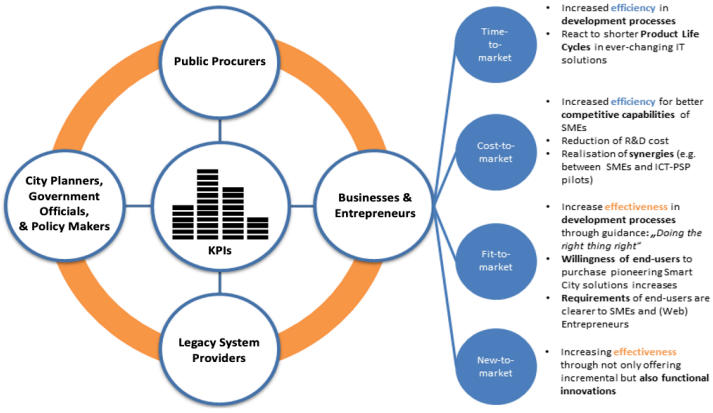

Fig. 2. Categorisation of KPIs for entrepreneurial support in Smart Government ecosystems.

The service development takes place in the strategic outline that can be seen in the assessment pyramid in Fig. 3, whereas the vision is the top level (i.e. EC challenges for Europe), strategy (i.e. funding instruments, call topics, and key initiatives) is therefrom derived, and concrete objectives are defined for individual smart solution providers. We see ourselves herein as a research partner which assesses critical success factors and KPIs, besides defining key actions in the sense of recommendations and best practices for smart solutions. For all the elements targeted by the pyramid, its approach foresees a phasing in which the elements are created, registered, filed, used, stored and – if needed – re-designed. The re-use of the elements is a key goal, hence promoting the transferability of the one smart solution approach to other municipalities and generating a framework which makes the services comparable within the Lake Constance region.

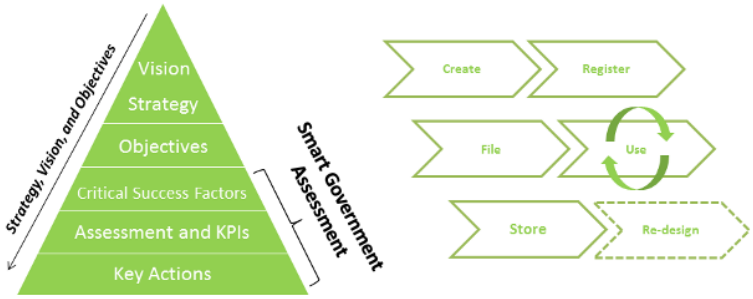

Fig. 3. Services assessment pyramid and phasing of innovation and service tracking

4 Smart Service Development Use-Case Analysis: Smart Care and e-ID applications

4.1 Schaffhausen's eID+

The continuous increase in the supply of online services is accompanied by a rise in the importance of electronic identification (e-ID). This issue is covered in regulation No 910/2014 of the European Union, which argues that "building trust in the online environment is key to economic and social development. Lack of trust, in particular because of a perceived lack of legal certainty, makes consumers, businesses and public authorities hesitate to carry out transactions electronically and to adopt new services" (*On electronic identification and trust services for electronic transactions in the internal market ,* Regulation 910/2014). Private sector involvement has increased significantly in recent years, especially for higher value applications with banks being the main players (Müller & Windisch, 2018)

In 2017, the canton of Schaffhausen launched its own electronic identity, the eID+, which was developed in a PPP with Procivis, a swiss tech-start-up providing the required technology. In this way, the canton targets the development of a unique selling

point in terms of innovation and technology in the competition among business locations. The eID+ identity system – which is based on blockchain technology – enables citizens to access official services directly via smartphone. The app guarantees data privacy control and users can decide for each service respective data recipients and have the option of digitally signing documents. The data is protected by strong encryption including password-based and/or biometric procedures (Kanton Schaffhausen, n.d.)

In the sense of a Smart Government co-creation, citizens were involved in a "co-design process, to ensure a solution design that benefits the public stating the needs in the first place" (Andermatt & Göldi, 2018). In the research project Smart Government Academy for the Lake Constance region the University of St. Gallen analyses processes and shows how service delivery is improved from the users' perspective. The University of Applied Science Vorarlberg in turn examines, which requirements the eID+ needs to fulfil in order to be accepted by the private sector. As it can be noted: "technology is only the customer facing front-end of a complex set of organizational structures, policies, and processes that are designed to provide particular services" (Rose & Grant, 2010).

4.2 Dornbirn Smart Care

For some time now, population forecasts have confirmed that the aging of Austria's population continues to progress. Currently the percentage of over 65 years of age in Austria's total population is about 19 %. Twenty years from now, in 2040 this percentage is forecasted to rise up to 26 % (Statistics Austria, 2020; Austrian Conference on Spatial Planning, 2019). In 2030, up to 72,900 additional staff in the health-care sector will be needed - compared to 2017 (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019b). The shift from multi-person to single-person households, the decline in fertility, and child mobility (Grossmann & Schuster, 2017) are additional challenges. In the current care provision report of Austrian's Federal Ministry Republic of Social Affairs, Health, Care and Consumer Protection, a strong focus lies on homecare, especially on Ambient Assisted Living (AAL) (Federal Ministry of Social Affairs, Health, Care and Consumer Protection, 2019a; European Parliamentary Technology Assessment, 2019).

The city of Dornbirn sought to understand whether the connection between intelligent systems and existing human resources can ensure a self-determined life in old age within one's own four walls. Based on a study of several focus groups, a specification book was developed, and service and support scenarios were prioritised which can serve as a reference for future policy making. Participants consisted of service providers and service recipients as well as representatives of the city administration. The initial results in our use-case mapping of Smart Care potential for the City of Dornbirn concluded two challenges. Firstly, there is no sufficient consideration for the application of intelligent technological systems by most actors in the outpatient care as well as by the end users. To tackle the issue, the stakeholder groups have now planned to set up a regional physical consulting and service centre in combination with a showroom for AAL technologies.

Secondly, efficient coordination of care and nursing institutions is unanimously seen as a key potential for the development of services for smart care in the region. The potential therefore lies in care management which can defined as "the establishment, planning and management of a largely binding, standardised and coordinated cooperation of professional and voluntary actors in the region who offer assistance and who can be coordinated for individual cases" (State Government of Vorarlberg, 2019).

5 Conclusion and Outlook

Under headings like Smart Government, Smart Cities, and PPPP, municipalities are launching ICT and digitalisation initiatives aimed at the holistic deployment of digital, public and private smart services. Even where geographical proximity and similar socio-economic conditions of the municipalities are often present, a systematic exchange of methodologies, service design approaches, and best practices is missing. In this paper, we describe how services can be developed in the public sector, especially in cooperation with private as well as academic partners in co-creation settings, sometimes referred to as quadruple-helix. We present approaches we designed for service development in Smart Government and Smart Cities settings in the Lake Constance Region, especially those developed in the research project Smart Government Academy for Lake Constance Region. After an initial presentation of the KPI framework, innovation management methods, and phasing approaches, we conclude the paper with two exemplary use-cases conducted within the research project. In next steps, we plan to refine the KPI set as well as the Service Development Cube and adapt the results for a generalisation which supports the replicability and scalability for further use-cases in the region but also on a European level.

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