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Smart City Selling? Business Models and Corporate Approaches on the Smart City Concept

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In the era of knowledge economy and rapid technological development related to ICT, open data and IoT, cities became living laboratories where new forms of urban operations are envisioned and introduced. In this regard, cities are markets offering numerous opportunities for the private sector to introduce smart products and services. So far, a considerable amount of literature has been published regarding the theoretical as well as technical aspect of smart city models. Still, there remains a research gap in terms of in-depth empirical studies related to the involvement of the private sector into creating frameworks for a smart city design and implementing business models in cooperation with the public sector. Based on two case studies – cities of Warsaw and Hamburg, the goal of this paper is to discuss the actual involvement of the private sector in establishing smart cities. Firstly, the relation between the smart city term and actions taken, as well as corresponding business models adapted by the private sector regarding this area are discussed. Secondly, empirical case studies' analysis based on semi-structured interviews, secondary data and desktop research was conducted. The results presented may facilitate improvements in strategic urban management and business development.

Keywords: Smart city; private sector; urban business models; Warsaw; Hamburg

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Introduction

In the era of rapid technological development coupled with global economic crisis, cities became new markets for private industry in numerous fields including smart products and services. Smart city market is estimated to reach the value of 1.565 trillion USD by 2020 (Frost and Sullivan, 2014). In this context the article aims to stimulate discussion on the involvement of private sector in smart city models development and application of urban business models into urban environments. Therefore, two research questions were addressed: 1) How is the private sector involved in smart city initiatives creation? 2) What are the strategic urban operations, in which smart city solutions are applied most? To explore these questions the research was divided into two phases – theoretical and practical. Based on the literature review, the theoretical part is devoted to the examining the smart city paradigm in terms of the private sector's engagement and urban business models emergence. In the practical part two case studies were analysed, the cities of Warsaw and Hamburg. Both case studies have been built up by desktop research and secondary data analysis, additionally semi-structured interviews with private sector representatives served as the method of analysis in the case of Warsaw and open talks with expert were conducted in the case of Hamburg. These two European cities were chosen based on comparable sizes of area and population. The study was focused on identification of similarities and differences in approach to the issue of introducing private sector products and services in areas traditionally supported by public entities.

Smart city and the private sector

Smart city is a paradigm that has been defined for a number of years by representatives of academia (Albino, Berardi and Dangelico, 2015; Angelidou, 2014; Caragliu, Del Bo and Nijkamp, 2011), the private sector (Falconer and Mitchell, 2012; IBM Institute for Business Value, 2009; KPMG, 2015) as well as international institutions (European Commission, 2014). Nevertheless, one generally accepted definition is lacking. The concept is rather amorphous (Albino, Berardi and Dangelico, 2015) and in principle related to the application of technologies, in particular information and communications technologies (ICT) to solve particular urban problems related to transportation, energy, buildings, waste etc. (Batty et al., 2012; Nam and Pardo, 2011; Paroutis, Bennett and Heracleous, 2013). Therefore,

the relation between technology and cities, especially in terms of the private sector’s engagement in smart cities discourse is crucial (Coutard and Guy, 2007). Even if big data and networked computing already form part of daily life (Pickren, 2016), a smart city paradigm is claimed to be a broader ecosystem linking together human, infrastructural, social and entrepreneurial capital (Scuotto, Ferraris and Brescian, 2016). This clearly relates to the STS (Science, Technology and Society) discourse, inter- and transdisciplinary approaches, in particular socio-technical networks (Sauer, 2012), as well as assemblage of human and non-human actors (Coutard and Guy, 2007). See fig. 1 for an exemplification of corresponding data sources between public and private sector and possible value creation. The conceptual linkage of technological and social development becomes particularly important since the broader trends of smart urbanism (Marvin, Luque–Ayala and McFarlane, 2015) would affect not only cities, but the entire built and social environment.

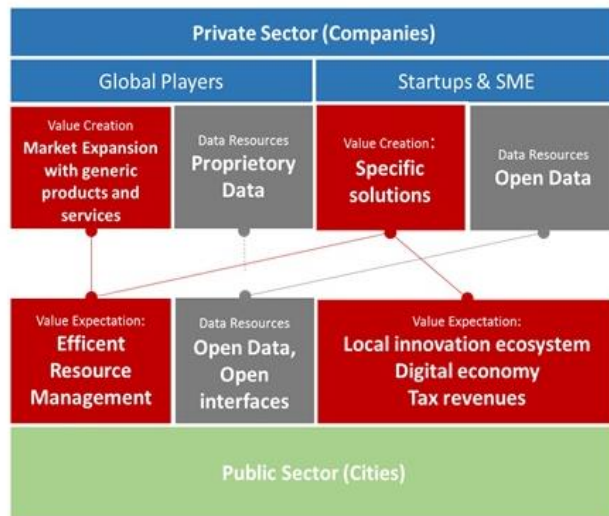


Figure 1 Matching and correspondence of data resource between public and private sector and possible value creation (Source: Authors).

Nonetheless, there is a growing number of critical research on smart city (Hollands 2015; March, 2016; Marvin, Luque–Ayala and McFarlane, 2015; Townsend, 2013). Hollands (2015) draws attention to the fact that currently the smart city model is driven by profits from global technology companies since urban areas are considered to be drivers for innovation (Scuotto,

Ferraris and Brescian, 2016). Firstly, smart city products and services may 'potentially provide ICT companies with alternative growth initiatives' (Paroutis, Bennett and Heracleous, 2013, p. 270). Secondly, the private sector creates demand for smart solutions contributing to the extensive smart city branding (Hollands, 2008). Therefore, the smart city concept is being referred to as a hegemonic corporate term (March, 2016), being described as a business-led, neo-liberal urban utopia (Hollands, 2015) or techno-utopia (Wiig, 2015).

Top vendors in smart city market such as IBM, Cisco, Siemens and Hitachi are all global corporations (Government Technology, 2014). When discussing the private sector, still a further differentiation into large global companies, SMEs and startup companies should be made. Multinational players, who promote themselves as heralds of smart technologies, seek added value mostly through market expansion and penetration. This applies especially to providers of IT infrastructures and services. IT infrastructure companies are now attempting to expand their increasing dominance in field like cloud computing, data storage and analytics. Companies like Google, IBM, and Cisco have discovered urban data business as a highly potential market. The creation of urban data platforms that synergize urban data from various resources is a key component in their market strategy (Hollands, 2015; Söderström, Paasche and Klauser, 2014). On the other hand, local start-up companies and SMEs pursue different models of value creation and business operations. Their smart city products and services usually depart from specific problems and are often based on context determinants such as skilled labour, technology ecosystem, and public funding. In other words, they are more dependent and responsive to local conditions and use open sources and interfaces for products or services development (Klein and Vega-Barachowitz, 2015). Still, local entrepreneurs may be limited in their creation of smart innovation as was the case in the Living Lab project examined by Sauer (Sauer, 2012).

Urban business models

In order to analyse smart city strategies in the private sector, the authors suggest to scrutinise smart operations through a business models approach. Business modelling is used in the field of economics to secure and maintain operations of enterprises and organisations. Recently business modeling has been adopted in the urban context by interpreting key business

Smart City Selling? Business Models and Corporate Approaches on The Smart City Concept parameters from the urban planning and management perspective (Noennig et al., 2016).

Prominent business models applied in urban areas are based on the Open Innovation (OI) model and the Network Innovation Ecosystem model (NIE) (Scuotto, Ferraris and Brescian, 2016). The OI model contributes to innovation creation by exchanging knowledge and linking various stakeholders in a city’s operations, i.e. local government, citizens, startups, SMEs, corporations, academia. According to Scuotto, Ferraris and Brescian (2016), the OI approach is beneficial as: 1) industry gets advantages from other stakeholders; 2) companies may not only exploit but also commercialise technologies and test new business models; 3) companies can enlarge the portfolio of their partners through acquiring strategic business partners (Scuotto, Ferraris and Brescian, 2016, p. 360). An example of the OI model are Living Labs, where new urban solutions are being introduced and tested. The NIE model, in turn, is based on exploiting external resources, sharing know-how and participating in co-creation of particular products. The focus is on investment in R&D through providing proactive role of both business and government. Eventually, strategic partnerships are built to ‘share knowledge and innovation resources like ICT tools, technology platforms, and e-services application’ (Scuotto, Ferraris and Brescian, 2016, p. 359).

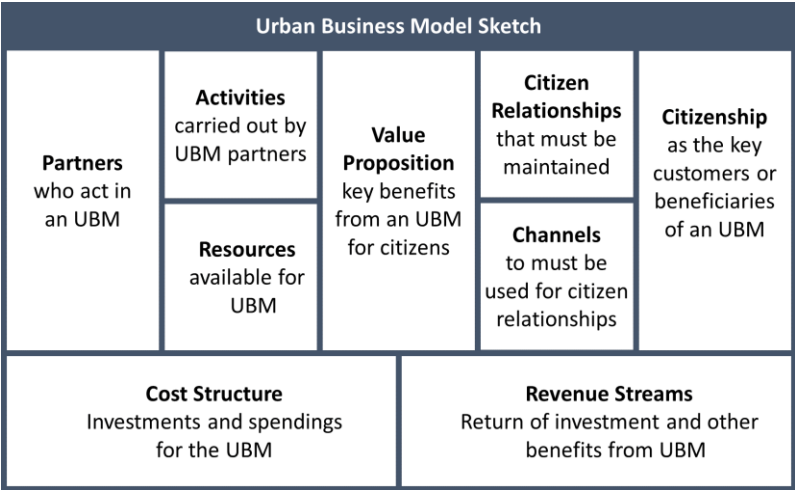


Figure 2 The structure of an Urban Business Model (Source: Knowledge Architecture Lab, TU Dresden).

Adopting the existing methodologies in the field of business modelling and strategic urban planning and management, the methodology called 'Urban Business Modeling' (UBM) was developed to support the systematic generation of new operations and business models in urban settings (fig. 2).

The UBM methodology, which models the cities in analogy to enterprises, supplies urban analysis, assessment of future projects and strategic urban visions. Specified into an urban business model with special focus on the urban data ('Urban Data Business Model', UDBM), the method helps to bring the different smart city models from private and public sectors into one conceptual framework (Noennig et al., 2016).

Warsaw

Smart city concept in Warsaw

Warsaw is one of the biggest cities in CEE region. Its population is estimated at 1,735,442 (Central Statistical Office, 2015). Current Development Strategy of the City of Warsaw towards the year 2020 (UM Warszawa, 2005) does not include references to the smart city model since at that time this concept was a novelty.

In late 2015 work on the revision of the strategy titled #Warsaw2030 began and is due to be finalised in 2017 (UM Warszawa, 2015). Teams working on strategy revise it in accordance to elements enlisted by the European Commission as key to develop a coherent strategy and smart city program (European Commission, 2013). So far the city hall gathered a broad group of experts as well as organized numerous public consultations to create a vision of Warsaw in 2030 as a city of active people, friendly and safe place, and open metropolis (UM Warszawa, 2016). Yet, again this vision does not directly address the concept of smart city, but the idea behind this approach is that smart solutions are supposed to be triggers for a better quality of living.

Smart city projects and applied business models

Warsaw attracts both international capital and domestic investment (Gorzelać and Smętkowski, 2012; Griffith, 2016). It is one of the largest markets for investments in ICT-based solutions not only in Poland, but also in CEE countries in areas like transport, energy and data analytics. In this regard, Warsaw is a market for most of global ICT firms, just to name a few: Microsoft, Google, IBM, HPE, Orange, T-Mobile (Gorzelać and Smętkowski, 2012).

On the basis of primary and secondary research it could be assumed that in terms of business models application, companies active in Warsaw do not offer tailor products or services. Those products, including IoT cloud platforms are already designed and if necessary may be slightly modified. Companies have not changed their business models but modified their products and services according to ‘smart’ trend to attract cities as new partners. All in all, the field of activity of private sector is generally related to the following connected with each other areas (Table 1):

- ICT and Big Data,
- Buildings,
- Energy.

Table 1 Smart urban operations in Warsaw.

IDENTIFIED AREAS OF SMART URBAN OPERATIONS	DESCRIPTION
ICT, big data	The market is monopolised by global (Microsoft) and domestic (Comarch) corporations offering smart city platforms for management of urban big data, more efficient contact with citizens and providing public safety.
Buildings	Smart technologies are usually implemented in the office building by big development firms. In this regard, an active entity is SKANSKA. Also SMEs and startups offer their services in this fields. This usually concerns tools for building energy management.
Energy	Private companies like Orange (smart meters), Atos (smart grids and meters) and Philips (energy efficient LED lightning) are active in this area.

Without further discussion if approach towards smart city concept in Warsaw is correct or not, it has to be emphasized that cases of smart projects already exist and often include ICT, buildings and energy solutions in one. Due to activity of international corporations including Microsoft and Orange and domestic enterprises like Comarch many smart city innovations applied in Warsaw regard ICT solutions. This includes eagerly awaited by many Varsovians smart parking systems which was commissioned by the Municipal Road Authority to Comarch (UM Warszawa, 2016). Moreover, global corporations sponsor and organize event related to big data and IoT, i.e. Hackathons and Living Labs. e.g. BIHAPI – Business Intelligence Hackathon API (Orange, 2015). In this case, smart city vendors use open innovation business model.

So far flagship projects include 19115 contact telephone number, website and mobile application and ‘Virtual Warsaw’ project financed by Bloomberg Philanthropies in ‘Mayors Challenge’ contest to apply beacons for creation of mobile application supporting people with visual impairment in moving around public spaces, buildings and transportation (Ifinity, 2014). Other area in which smart building solutions are applied is the existing building stock and particularly commercial offices. Smart solutions like meters and sensors are applied more frequently to support savings in consumption of energy, water and other resources, and enable effective waste management (e.g. reuse of grey water). To increase efficiency and security of buildings daily operations Building Management Systems (BMS) are being introduced and combined with ICT technologies (Brodowicz, Pospieszny and Grzymala, 2015).

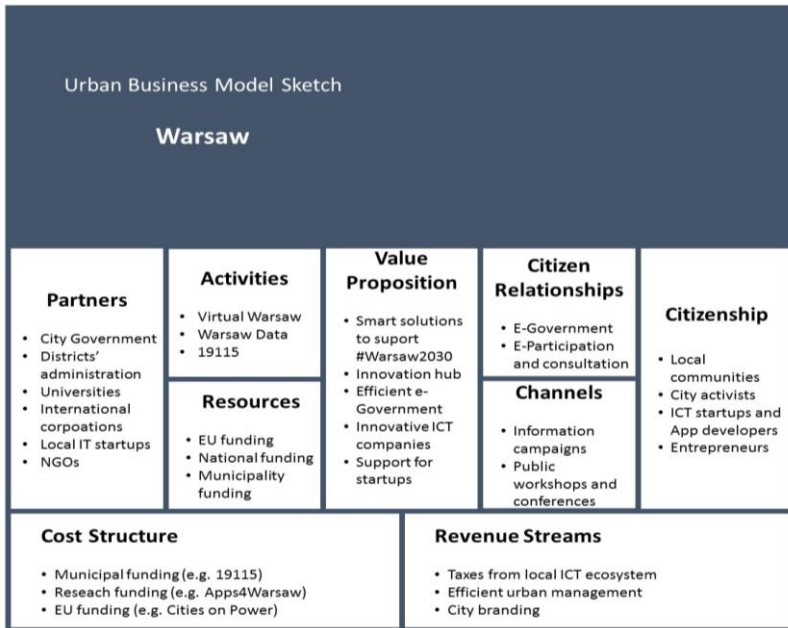


Figure 3 Warsaw Urban Business Model (Source: Authors).

Important city projects related to smart paradigm are also ‘Open House’ – benchmarking methodology for estimating sustainability of a building (Open House, 2016), ‘Cities on Power’ – project aiming at investments in renewable energy sources (Cities on Power, n.d.), ‘Apps4Warsaw’ – open

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platform with urban Big Data (NCBiR, n.d.). Moreover, starting with Smart City Forum (Smart City Forum, 2016), City 2.0 – Smart City conference (Computerworld, 2016) and Smart City Warsaw blog (Dominiak, 2015), there is a growing number of networking platforms for cities and various industries (not only those related to Warsaw) to share information about existing and planned projects.

Smart city projects implemented in Warsaw are rather a result of numerous networking initiatives, projects and solutions provided in cooperation between private and public sector rather than solely public decisions. Above mentioned projects and investments are in the majority based on EU funding (Kustra and Brodowicz, 2016). Business models applied are in some cases based on public private partnership, but most of them have a form of cooperation based on public procurement law (fig. 3).

Current state of the research proves that potential areas for business activities that still remain underexplored in Warsaw are consultancy and urban labs. However, consultancy services are offered, there is a considerable gap in terms of smart city consultancy firms on the market. Regarding urban labs, this endeavour may offer concrete innovative advantages to the city and therefore should be subjected to significant investments.

Hamburg

Smart city concept in Hamburg – Hamburg Digital City

The Free and Hanseatic city Hamburg is one of the economic centres in Europe and the second largest city in Germany with 1,8 million inhabitants. Hamburg has clearly committed itself to becoming a Smart City, issuing a Digital City Roadmap ('Leitbild Digitale Stadt') in 2015 (City of Hamburg, 2015). Due to being a city–state without any superior authority on federal state level, public and private actors are closely networked. Institutional distances are short, thus communication processes are quick in politics as well as in the business sphere. This peculiar set–up allows for comparably quick and agile decision making in regards to urban policy and strategy making. Thus, the smart city agenda is strongly driven by the city government and authorities, yet involves a broad partnership of stakeholders, including research and education facilities, startup companies, SME as well large global companies, i.e. Cisco (Cisco, 2014; City of Hamburg, 2014).

As Hamburg is a growing city, various large-scale urban construction projects are going on. Most notable is the new Hafencity (Harbour City), Europe largest urban development project, which increases the inner city area by 40% by re-using former harbour areas (Bruns-Berentelg, 2010). The Hafencity, however, does not follow an explicit Smart City agenda, due to being schemed almost 20 years before. Nevertheless, currently the project is being referred to as a smart endeavour (Cisco, 2014).

Table 2 *Smart urban operations in Hamburg.*

IDENTIFIED AREAS OF SMART URBAN OPERATIONS	DESCRIPTION
ICT, Big Data	Small enterprises like Breeze work on sensor systems and data analytics. Cisco is an active stakeholder in providing ICT solutions.
Smart Port	SmartPORT initiative by Hamburg Port Authority (HPA) enhances port operations with networked logistics technology and seeks to establish the port as a smart city testbed/model for Hamburg city.
Transport	Research and Development partnership with Volkswagen (2016) was established to transform the city into a testbed for various intelligent transport systems (ITS).
Governance	“Digital First” is the institutional programme of Hamburg’s city authorities to develop new effective formats of e-government/data-government, and of participatory exchange with the citizenship.

Smart city activities and applied business models

As a top-level governmental policy, Hamburg’s Digital City Agenda is manifested by a number of projects that span across multiple levels of activity. A key activity is the long-term establishment of an urban data platform aiming at integrating all urban data resources, such as environmental, mobility or demographics data. The aim here is to stay independent from proprietary platform solutions as offered by large corporate vendors. In addition, Hamburg has issued a transparent data law, securing that urban data are being processed in a way that citizens can access and investigate them freely (Neuhüttler, 2015).

With key players of the Digital City Agenda, the authors have carried out expert talks, which were documented and analysed in regards to key strategic terms, actor networks, and development agenda. Experts included representatives of Digital City Steering Center of Hamburg, CityScience Lab at Hamburg Hafencity University, Hamburg Authority for Urban Development (including Data Office), Hamburg Port Authority, among

others. Based upon these investigations of smart city initiatives in Hamburg plus secondary data research, it may be affirmed that the field of activity of private sector in Hamburg is generally related to the following areas (Table 2):

- ICT and Big Data,
- Smart Port,
- Transport,
- E-government.

Urban Business Model Sketch				
Hamburg Digital City				
Partners <ul style="list-style-type: none"> • City Government • Administration • Hamburg Port Authority • 4 universities • International Enterprises • Local IT startups • Cultural Actors and institutions 	Activities <ul style="list-style-type: none"> • Digital City Roadmap 2015 • Steering Center Digital City 	Value Proposition <ul style="list-style-type: none"> • become leading digital city in Germany with • Efficient e-Government • Innovative ICT Enterprises • Digital Citizen Participation 	Citizen Relationships <ul style="list-style-type: none"> • E-Government • E-Participation 	Citizenship <ul style="list-style-type: none"> • Neighbourhood initiatives • Activist and volunteer groups • ICT and Media Entrepreneurs • Migrants and Refugees
	Resources <ul style="list-style-type: none"> • State funding • Federal funding • Local economy commitment 		Channels <ul style="list-style-type: none"> • Public Citizen Workshops • Universities' IT alliance 	
Cost Structure <ul style="list-style-type: none"> • Project Funding (e.g. e-Government initiative) • Institution building (e.g. Digital City Steer. Center) • Research funding (e.g. HCU CityScienceLab) 		Revenue Streams <ul style="list-style-type: none"> • Taxes from local ICT ecosystem • Establishment of global company branches • Effective / efficient city management 		

Figure 4 Hamburg Urban Business Model (Source: Noennig et al., 2016).

In the past years, Hamburg – which has an influential, committed, and well-organised citizenship – has established itself as a ‘Public participation capital’ in Germany, due to numerous urban and social development projects that broadly involved citizens (Petrin, 2012). Following citizen-driven smart city-concepts (Beinrott, 2015), these activities supports the vision of Hamburg as a smart city not only based on IT and CPS technologies (Caragliu, Del Bo and Nijkamp, 2011), but also on networked communities

and e-culture. This turn towards digital culture reflects in several on-going EU funded H2020 research projects, such as *My Smart Life* and *Smarticipate*, and also the *eCulture Agenda 2020* issued by the Cultural Department (Persberichten, 2015).

As upcoming large-scale development project after the Hafencity, urban districts like Rothenburgsort are designated testbeds for smart city solutions. Following Living-lab approaches (Cosgrave, Arbutnot and Tryfonas, 2013), concepts are being developed to large extent in public-private partnerships both with local as well as with global companies. Focus is on issues such as urban health, urban ecology and sustainable urban development. In cooperation with Cisco, for instance, urban scale demonstrators have been created already for Smart Roads and Smart Lights in the port area. Another cooperation signed with Volkswagen in 2016 intends to transform the urban area into a testbed for future urban mobility, supporting the city's application for hosting the eminent conference-fair ITS Intelligent Transportation Systems in 2021 (by this year autonomous vehicle system may be available in Hamburg). Figure 4 presents the complexity and variety of smart initiatives within the urban business model in Hamburg.

To supply on-going Smart City projects on a reliable scientific basis, the city of Hamburg has implemented and funded research initiatives dedicated to digital city research and computer science. A computer science taskforce across all universities in Hamburg is to identify urban key challenges from an informatics perspective, such as communication networks, algorithm design, sensor systems, and data analytics. With similar intention, the City Science Lab at Hamburg HafenCity University was established as a cooperation with the MIT Media Lab to investigate contemporary urban challenges related to digitization (City of Hamburg and Hafencity University Hamburg, n.d.). Other metropolitan research projects aim to clarify the role of citizens participation and interaction within smart community processes (Performing Citizenship, 2016).

Conclusions

One of the more significant findings to emerge from this study is that in light of the current global economic situation, technological advancements, and demographic growth cities remain receptive markets for smart solutions and products. Due to legal obligations, such as the responsibility to provide public transportation, cities are not only clients, but active partners of global

ICT corporations, SMEs and startups serving their smart solutions for everyday's urban life. However, the private sector not only offers products and services, but also creates demand for 'smart' solutions and contributes to the popularisation of the term for marketing and strategic reasons. Thus the collaboration between public and private bodies is ambivalent. Examples of positive outcomes are increased connectivity, information sharing and open data. From a more critical stance, there is a growing conviction that for corporations, cities are just another market to explore and exploit, and to potentially abandon again if economically feasible. Nonetheless the positive examples give proof that even profit driven partnerships between cities and private industry may offer substantial advantages to cities, e.g. value creation based on open innovation business models.

Table 3 Warsaw and Hamburg – concluding remarks.

	WARSAW	HAMBURG
Existing smart city strategy	No explicit smart city strategy	Existing Smart City Strategy, Roadmap "Digital City Vision".
Smart city main promoters	Private sector	Local government
Smart city operations	Big Data/ICT, energy, buildings	Big Data/ICT, Smart Port, Mobility and Transportation, governance.
Selected gaps	Consulting, Urban Labs, transport	Large scale demonstrators, science-to-business cooperation.
Global corporations	Participate actively.	Strong push into selected application areas (e.g. Smart Port), excluded from the urban data platform development.
SMEs and start-ups	Small ecosystem	Small ecosystem

Hamburg follows a smart city initiative actively prepared and promoted top-down by the city authorities, with major companies like Cisco being involved. Still precaution is taken in regards to critical data infrastructures (e.g. urban data platforms), where a vendor-lock-in with private supplies is seen as critical. Here policy-makers advocate open and non-proprietary smart services. The city's digital urban business model (as drawn up by the authors) focuses on digitization and innovation, which is based on OI and NIE business models balancing the private sector engagement with a high public commitment. Warsaw provides another approach, in which companies are triggers for implementation of smart solutions. In terms of Warsaw's smart city approach, no explicit public strategy exists. Nevertheless, qualitative analysis has identified that there is a significant

'smart' technology push both from global as well as domestic companies. Business models applied to this urban environment are based on the OI model.

Regarding targeting of strategic areas for private investments, in both case studies, projects related to Big Data and ICT-based solutions are the most frequent. Moreover, technology-based solutions are the most profitable to be offered by corporations which already own the infrastructure and know-how, previously offered to industrial clients. It may prove the fact that even if products or services are branded as city-tailored, in fact they are not. In addition, the focus on urban operations contributes to the assumption that it is a technology that constitutes the core of a smart city even though both private and public sector may take strong activities to prove the opposite (see e.g. Hamburg's digital participation or e-governance projects). Final remarks regarding the analysis of two case studies are provided in Table 3.

These findings have significant implications for the understanding how the smart city paradigm is evolving and being created, which is essential from the strategic urban planning and management point of view. The scope of this study was limited in terms of case studies. Thus, more detailed research based on empirical case study analysis from a larger number of urban environments is suggested. Further research in this field might also investigate how private sectors business models and public sector urban models – potentially going beyond smart city models – can be brought into one unified framework. To frame the highly dynamic yet divergent developments in 'smart' urban technologies on the one hand, and their implications for urban society, public engagement, social development and cohesion on the other, STS discourses such as technology impact, technology politics and regulation may serve as a reference in further research.

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