

PUBLIC-PRIVATE PARTNERSHIP FOR SMARTER CITIES

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Abstract

The paper focuses on the role of public-private partnership as a tool that can facilitate smart transformation of cities and regions ensuring wider range of opportunities for various stakeholders including citizens, business actors, authorities, educational institutions, NGOs and so on, as well as create a more sustainable economic and social environment. Particular attention is paid to the experience of the leading smart communities in different countries, in terms of the applied models of private-public cooperation. The SWOT-analysis of the PPP concept in smart cities is conducted based on which the conclusions regarding its impacts and potential are made. Based on the recent trends in urban development the importance of searching for new approaches to the city governance, in order to deal with the challenges more efficiently and provide better services for the citizens, is highlighted. The concepts of Smart Cities are viewed as powerful vehicles for fostering urban prosperity.

1. Introduction and Research Context

The exponential development and extensive dissemination of the ICT (information-communication technologies), occurrence of their most advanced forms such as Internet of Things, Artificial Intelligence and other disruptive technologies do actively fuel the relatively new phenomena of smart cities, which require searching for out-of-the box strategies and solutions in the fields of urban administration and social policies. [40] The UN resolution 72/228 Science, technology and innovation for development from 20 December 2017 reaffirms «the central role of Governments, with active contributions from stakeholders from the public and private sectors, civil society and research institutions, in creating and supporting an enabling environment for innovation and entrepreneurship and the advancement of science, technology and engineering, in accordance with national priorities». [36] This approach is revealed in the Public-Private Partnership (PPP), which allows engaging multiple stakeholders in the smart transformation processes and is widely applied by the municipalities in numerous countries. [11] PPP is viewed as a prioritized form of implementing multi-stakeholder projects, especially at the initial stages. [20] The municipalities that are less advantaged or are associated with weak economic conditions are provided with a chance to make smart quantum leap and serve their citizens better as a result of crowdsourcing and attracting investments instead of being left on the back-burner. [2]

At the same time, PPP is applied case-by-case and may significantly vary in terms of its structure and realization, which also impacts the final outcomes. [19], [42] So, there is a strong need to consider the particular PPP practices applied by the leading smart communities as well as to research pros and cons of PPP as a tool enabling smart transformations. The SWOT analysis

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derived from the literature review as well as particular smart city examples is to be conducted. The SWOT methodology was chosen as it allows detailed consideration of the impacting factors, in terms of the multidimensional perspective, which is needed to draw the research conclusions. For the purposes of this paper, the examples of the world leading smart cities such as London, Bristol (the UK), Barcelona (Spain), and Amsterdam are considered to determine the approaches to PPP applied. There are two reasons why these cases were selected for analysis: all of these cities implement and emphasize on the importance of PPP, and the leadership roles within the PPP seem to be taken a bit differently, so it is important to analyze and reveal whether the difference in approaches to PPP is present. [6, 3, 16, 24, 34]

2. Research Findings

2.1. Defining Smart Cities

Although there are quite many definitions of the smart city provided on a case-by-case basis, the majority of them focus on pointing out the essential components of a smart environment. [12], [28] According to Deloitte, smart city refers to investments in certain components triggering sustainable economic growth and better quality of life achieved through participatory governance, wise allocation of resources, and innovative management. The inclusivity is a vital characteristic of smart cities. [33] The key investment areas are as follows:

- a. human and social capital;
- b. traditional infrastructure;
- c. disruptive technologies.

The given definition emphasizes on investment, participatory governance and allocating resources on the cooperative premises as indispensable aspects of Smart municipalities. According to the IBM report on Smart cities, the key dimensions of Smart-cities are smart-manufacturing, smart health, smart buildings, open data, digital citizens, smart transportation, smart energy utilities, mobility or Wi-Fi, and smart government. [8]

Similar approach of defining a smart city through its components is present in the work of Meijer and Bolivar (2015), where smart city is viewed as a holistic combination of technology, human resources and collaboration. [26]

2.2. PPP as a Core Element of Smart Cities

The PPP can be defined as a durable collaboration between public and private actors related to providing common services, allocating risks and investments or joining efforts to achieve socially valuable outcomes. [20] Among the typical smart-city benefits that are already becoming visible, there are co-creative decision-making and participatory relationships between public and private actors. [4] Smart-city means interplay of various stakeholders working together in a framework of partnerships in different forms. According to Selada, a city should not be considered as smart, if the stakeholders are not involved in the innovative processes. Successful implementation of smart city concepts is based on the Quadruple Helix model that provides cooperation of academic circles, industry, civil society, government and people. [31] The key smart city stakeholders or interrelated and interdependent actors are mentioned in Table 1. All of the elements are equally meaningful, though the citizen-centric approach is a key prerequisite of good governance. As in terms of PPP, more attention is usually paid to the entrepreneurial or citizen aspect, but there are researches

emphasizing on the importance of considering political and civic dimensions of smart transformation. [10] The four modalities of smart city such as the service-user, entrepreneurial, political, and civic are considered to be arriving from the particular techno-public assemblages consisting of issues, people, practices, and space.

| | | | |
|---|--|------------------------------|--|
| Investors | Research Institutions | Digital Agencies | Technology Vendors |
| Manufacture & Construction Companies | NGOs | City Government | Public Housing Associations |
| Political Circles | Citizen or User | | Energy Providers |
| Public Transportation Providers | Startup Incubators | Health Care Providers | Banks & Insurance Companies |
| Telecom Providers | Hotels, Museums, Theaters, Stadiums | Logistics Providers | Retailers |

Table 1: Smart City Actor Map [28], [10]

Ruhlandt mentioned (2018) that the essential elements of smart cities are stakeholder involvement, collaboration, and engagement in decision-making. [30] The report “Mapping smart cities in the EU” emphasized that a smart city is a multi-stakeholder and municipality based partnership. [26] In context of the survey conducted by Philips, answering the question which stakeholder do they turn for advice and guidance related to smart city implementation, the municipalities of the leading smart cities focused on businesses (26%), city leaders (16%), private companies such as utilities (15%), citizens (13%), planners (12%), consortiums (10%), other (4%), NGOs (2%). At the same time, the survey proved that one of most common blockers to Smart-city development is the lack of stakeholder support. (5,1%) [32]

Lack of resources may pose a significant challenge to the smart concept implementation for the public authorities. PPP as a primary tool that should be used by the regions or cities in particular with weak economies and especially at the initial stages of smart transformation, also facilitates smart specialization and further economic growth, while the less advantaged communities turn into the investment-attracting spots. [29]

Through resorting to PPPs and crowdsourcing, cities are more likely to provide better public services and to build a long-term investment environment taking advantage of the private sector's “know-how”. [27] Moreover, the smart city concept is viewed as a promising investment tool. A Chair of the Scottish Cities Alliance and Leader of Dundee City Council, Councillor John Alexander emphasized that partnership between cities provided the community transformation bringing additional investments and positive community effects. It should be noted that the Scottish

Cities Alliance includes Aberdeen, Dundee, Edinburgh, Glasgow, Inverness, Perth and Stirling and the Scottish Government. The collaboration takes place in three directions such as Investment Promotion, Hydrogen, and Smart Cities. The Smart City concept implementation through the intercity partnership has brought 50 mln (of which 20 mln are investment of European Regional Development Fund) of pounds of investment in the city economy. [1]

It is worth noting that it is discovered that the smart city performance is largely triggered by the four main structural aspects of PPP such as deep involvement of numerous private partners, top-level planning by the local authorities, government-dominant infrastructure construction as well as hybrid organizational platform being a general contractor. At the same time, the correlation between transaction costs and governance structure of the PPPs was found. The success of the smart PPT is determined by the role and responsibilities undertaken by the government. [21] In context of the PPP, there are six key roles to be played by the city government such as connector and protector, director and regulator, strategist and advocate, solution enabler, and steward. It is empirically proved that the sustainability aspect of smart cities comes from dynamic processes driven by PPP in the framework of an open innovation platform. [19]

Therefore, PPP is an indispensable aspect of a smart city while its efficiency is determined by its structure and particular mode. Nevertheless, to procure smart city projects various tools may be used and one of the alternatives to PPP is Multi-Attribute Utility Analysis (MAUA), which was successfully applied to 8 types of common smart city projects in Hong Kong. It was shown that not all projects are best suited to PPP, so this methodology gives a space for preliminary estimate of PPP efficiency emphasizing on the importance of considering alternatives leading to a compromised solution that both public and private sectors would accept. [18] There are also some challenging issues related to defining particular aspects of PPP. According to Vrabie, based on the interviews conducted in Bucharest, Romania, there are 5 main operational areas to be considered in terms of partnership agreement between a town hall and other entities (business, civil society, private companies, etc.) such as degree of commitment, leadership hierarchy, decision-making, liability and flexibility. [39] Taking into account the diverse components of PPP, referring to particular examples of smart cities is highly relevant.

2.3. The Leading Smart Cities Experiences

The cases of 4 smart cities such as Bristol, London, Amsterdam and Barcelona are considered in order to analyze the partnership structures and approaches used by these cities. The choice was based upon the criteria of cities recognition as smart ones as well as their internal positioning. [6, 3, 16, 24, 34]

2.3.1. Bristol

Bristol is being consistently ranked as one of the top smart cities in the UK and the world. In 2015, it was awarded European Green Capital status. [15] [10] In context of the multilateral partnership structure, where the city council is viewed as one of many actors, of which no-one prevails, smart city activities in Bristol are characterized by the two key dimensions. Firstly, the council and the University of Bristol cooperate in the framework of «Bristol is Open» partnership, which focuses on providing digital infrastructure. [6] Secondly, there is the «Connecting Bristol» initiative that mostly relates to citizen and SMEs engagement. There the leading roles are performed by enterprises, e.g. Knowle West Media Centre. [9] So, the smart activities are based on the decentralized partnership model rather than orchestrated hierarchically by the council. The private, public and charitable organizations are equally influential and meaningful in the smart city concept

implementation and coordination. Particular attention is paid to facilitating multilateral dialogue with the city stakeholders. At the same time, the informational portal, Open Data Bristol, where the city council publishes the open data of different types is controlled by the private company Open Data Soft. [24] In accordance with the General Data Protection Regulation (GDPR) adopted in Britain in 2018, the city council is a Controller, i.e. it holds overall responsibility for the data protection, while the private company is an Operator. [6, 38] In case of any failures of the private partner the municipality would be liable for it that may cause both material and reputation losses. At the same time, the Bristol city council is very careful with the private partnerships related to the implementation of digital solutions. The multidimensional analysis is conducted to check the reliability of the partners. The council is vigilant in terms of using cloud technologies and hosting of the web-services such as Amazon. In this context, the strategy of reductionism and end-efficiency prevails over the declarative implementation of innovations at the expense of the security components. The smart city assemblages are viewed as based on the partnerships among the decentralized agencies and stakeholders rather than being imposed from the above through a certain centralized hierarchical model. [10]

2.3.2. London

Smart London is associated with a collaborative and entrepreneurial mode of governance. [24] The innovations are aimed at responding to the expected population growth while fostering sustainable economic growth. The smart initiatives in London are steered by the Greater London Authority (GLA) and specially the office of the Mayor of London that are placed at the heart of PPP leadership structure. [24] The cooperation with numerous stakeholders such as leading researchers, tech companies and others is happening through the Smart Board and project partnerships. It is worth noting that the GLA gives impetus and facilitates smart results rather than imposes directives. The cooperative governance strategy leads to attracting investments in the city infrastructure on the sustained basis and effectively revitalizes the city economy. London has been referred to as a “honeypot of technologies and partnerships.” [34]

2.3.3. Amsterdam

Amsterdam Smart City is positioned as a unique partnership between business, authorities, research institutions and the people of Amsterdam. [3] The focus is made on the aspects of open data, better working, living and mobility. The city is defined as an urban living lab providing businesses with opportunities of testing and suggesting innovative solutions. The partnerships do mostly take place in the fields of citizen participation, sustainable energy, e-health solutions, education, and transport. The smart platform also provides cooperation among national and international stakeholders. The Edge, in Amsterdam, is not only the greenest office building in the world, but also the most connected one. It is a living lab for innovative applications of the Internet Of Things in office environments. The building has a floor space of 40.000 m, houses for 2.500 people and is equipped with 30.000 sensors. As Bloomberg stated, it is the most connected office space in the world. [32] The living lab model is getting higher popularity as a practical embodiment of smart cities allowing targeting the actor components more efficiently from smart construction to academics.

2.3.4. Barcelona

Barcelona has been recognized as the third smartest city in the world. The typical feature of its success is the buy-in from the very top. The mayor and the city’s innovative chief technology officer have created the change-triggering environment through the authority-led partnerships. According to the survey, the respondents pointed out monitoring meters and optimized energy

consumption, as well as a comprehensive future vision to be among the most impressive aspects of their city. [16] It should be noted that Barcelona is often referred to as a personal success of the innovative chief executive that means a huge role of the centralized hierarchical approach in the smart processes. The city has adopted a common strategic vision that guides various stakeholders, so they are mutually contributing to its implementation while the objectives and indicators are set by the city council team.

2.4. SWOT-Analysis of the smart PPPs

As revealed by the SWOT-analysis based on literature review, PPP has very sound strengths such as attracting investments and leading to higher economic growth, not the least due to cost savings. [1, 29, 33] Moreover, it is associated with better understanding of the citizen needs and facilitating a citizen-led democracy. Smart city partnerships are often aimed at implementing sustainable solutions such as, for example, renewable energy infrastructure, which have positive synergy effects on the environment achieved through crowdsourcing and involvement of various stakeholders. PPP means practical implementation of Quadruple Helix model ensuring cross-sectoral cooperation of research institutions, business actors, people and public authorities that provides more efficient and multidimensional project implementation. It also improves the inner-city social environment. The inclusivity that is one of the fundamental objectives of smart cities is practically reached through the PPP [29]. PPP allows job creation and increases the existing opportunities for citizens, providing sound social value.

| Strengths | Weaknesses |
|--|---|
| <ul style="list-style-type: none"> • Increased investments and higher economic growth [1, 29, 33] • Costs Savings [1, 29, 33] • Involving various stakeholders [1, 29, 28, 33] • Promoting Sustainability [41, 6, 4, 15] • Practical Implementation of the Quadruple Helix Model [41, 6, 4, 15] • Inclusion [29, 32] • Multiplying Social Effect [22, 15, 3, 1, 13] • Facilitating citizen-led and citizen-oriented democracy [22, 15, 3, 1, 13] • Crowdsourcing • Jobs creation [37] • Co-creative decision making • Effective cross-sectoral partnership | <ul style="list-style-type: none"> • Private partners controlling the vitally important public city infrastructure • Higher dependance on the external resources and stakeholders [35] • PPP fits not all the smart city projects [18] • Lack of the unified understanding of PPP mechanisms • Uncertain Leadership hierarchy [3, 24, 6, 11] • Financial input from the municipalities may remain high [35] • Lack of unified monitoring and set indicators [43] |
| Opportunities | Threats |
| <ul style="list-style-type: none"> • Wider opportunities for international and intercity partnerships (city-2-city city 2 foreign city, city-state) • Creating inter-city smart clusters and facilitating inter-city cooperation [1] • Deriving benefits from smart specialization [29] • Developing PPP in the field of AI, Big Data, Open Governance [6] • Positive transformations of communities [6, 3, 16, 33] • Reaching the synergy effect of multiplied resources [1,29, 13, 33] | <ul style="list-style-type: none"> • Partnership and resource management risks • Socio-political risks • Security threats, especially in the field of Data Privacy • Lack of education and smart city planning skills of municipalities [32] • «Outsourcing trap» [35] • Municipalities may lose their responsibility to protect role • Unpredictability of the PPP outcomes [43] • Risks for municipalities to lose political leadership over the fundamental infrastructure [35] • Conflicting Stakeholders Goals [35] |

Table 2: SWOT-analysis of the PPP (Created by author based on the literature review)

The crowdsourcing and joint resource allocation also present a strength point. However, this advantage also poses the risk for the municipality to lose control over the processes, for which it is accountable. In the PPP framework, private partners may control the vitally important public city infrastructure. At the same time, the city councils are liable for the failures of the private partners that may cause the material as well as reputation losses for the public actors. The study of PPP-related threats, in terms of broadband infrastructure, which may be considered as quite a common project type for smart-cities, clearly indicates the partnership and resource management risks. Moreover, the conflict of interests may occur that will negatively impact the realization of its functions by the public partner. The municipality may face the so-called «outsourcing trap» while it transfers its key responsibilities to other stakeholders, so its impact, not the least in terms of reputation, will depend on the third parties whose activities they can impact and control only to certain extent. [35] Thus, the municipality may lose its control over the vital infrastructure, while it is still responsible to the citizens for wise handling of the infrastructure issues. As the control

system is distributed among numerous small-hand stakeholders, monitoring and setting unified performance indicators may be challenging. [43] The uncertainty and polysemantic nature of operational roles and functionality distribution among numerous stakeholders also lead to security threats, especially in the field of data privacy.

The PPP requires a system of controlling and preliminary analysis. To this end, there is a strong need that the municipal authorities have strong competence, education and skills that are sometimes lacking. Moreover, PPP should be considered through its applicability to particular cases as it was mentioned that sometimes the other models are claimed to be more appropriate. [18] The cases of four smart cities considered in this paper also showed that the mechanisms of interactions under PPP are defined case-by-case that leads to the lack of legal certainty. There is no unified leadership hierarchy as well as no single approach to the functions of the authorities. [16, 3, 24, 6] Lack of the unified understanding of PPP mechanisms may lead to its improper implementation and therefore negative consequences for stakeholders. As the control system is distributed among numerous stakeholders it may be more complicated to predict the final project outcome. At the same time, the opportunities such as developing AI solutions, deriving benefits from smart specialization, creating inter-city clusters both within one country and internationally are highly promising. Deriving benefits from the synergy of joint resources also intensifies the positive transformation of the communities. Overall, the positive effects of PPP prevail though the risks still exist being mostly related to the operational, technical and strategic mistakes that may occur at different stages of the PPP life-cycle. It is up to the municipality to take measures to resolve the challenges and avoid the potential threats through wise and systemic efforts paying precise attention to the challenging PPP aspects.

3. Summary and Suggestions for Further Study

Implementation of Smart-city concept in its comprehensive manner means keeping up with the recent urbanization trends. PPP is viewed as an essential underlying mechanism present in smart municipalities that presupposes wide cooperation of diverse stakeholders as well as a tool that can foster smart transformations of a city through the power of joint resources, co-creative decision-making and risk allocation. As PPP provides wider opportunities for the cities, it is also defined as a promising strategy of fostering city smart transformations while turning the municipality into the investment-attracting spot. Researching the experiences of the leading smart cities such as London, Bristol, Barcelona and Amsterdam has revealed that PPP is a commonly applied practice. At the same time, the PPP takes rather unique embodiment in each of the considered cases, in terms of the leadership structure and coordinating roles. In Barcelona, the PPPs are centric-based, initiated and coordinated by the city council. In Bristol, more freedom is given to the private stakeholders that can themselves coordinate smart city projects. In London, all the smart partnerships are carried out by the authorities but their role is rather advising than imposing partnership vision. Although PPP has numerous advantages including economic, social and those related to city governance, its implementation largely depends on preliminary analysis and distribution of leadership roles.

The SWOT analysis has revealed the positive effects as well as significant potential of PPP, in terms of social, economic, sustainability, transformative and other positive benefits. The risks and weaknesses of PPP determined in the SWOT-analysis are mainly arising from failing to implement proper monitoring, citizen-orientation, security and resource management strategies as well as risks-analysis of PPP. The strengths and opportunities will offset risks, if a municipality efficiently exercises the PPP monitoring and analysis, so it maintains its controlling and operational role, in terms of its responsibility to the citizens as a provider of vital services. Therefore, PPP is

considered as a key promising solution to reach a smart city transformation, in case of its proper implementation and risk assessment.

There is a strong need to further research the leadership structure of the smart PPPs, in order to determine the roles of the stakeholders, especially, the authorities such as the city council focusing on a higher number of cases. Also, it is important to pay more attention to creating the system of indicators that may be applied by municipalities as well as the monitoring methodology to measure smart PPP efficiency. Another interesting study direction is defining correlation between PPP implemented by a smart city and level of trust in the public partner (city council) expressed by the citizens. It may be relevant to measure the citizens attitudes towards PPP and the outsourcing mechanisms, in particular, with a view to revealing the potential “social value” impacts of the PPP. Contrasting and comparing different PPP types based on the particular projects examples is also relevant, so the pros and cons of each of the types can be discussed in a more detailed way. Furthermore, more consideration of challenges and possible response practices of the public authorities associated with the PPP life-cycle stages is needed.

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