WOLAŃSKI

EVALUATION OF THE IMPLEMENTATION OF THE SMART CITY CONCEPT IN VISEGRAD GROUP COUNTRIES

SHORT REPORT

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1. INTRODUCTION

1.1. GOAL AND SCOPE OF THE STUDY

RESEARCH QUESTIONS

In this study we explored the practical applications of the Smart City concept in public policies of four Visegrad countries. We were interested in the strategic level of the policies, that is, the programming documents, the operational level, which means concrete projects executed in cities and towns, and the interplay between those two levels. We addressed the sets of three research questions that covered both strategic and project level of investigation:

Q1: How the concept of Smart Cities has been implemented in key strategic programming documents in V4 countries?

This exploratory question examined the language used in different countries to describe Smart City ideas and trace the assumptions and models of Smart Cities promoted by the strategic documents. Thanks to this, practitioners from V4 countries understand how the different, often competing visions and Smart City models are encoded in a strategic document and how they determine the practical applications.

Q2: What are the good practices of Smart City projects in V4 countries?

This exploratory question identifies a pool of projects case studies. It illustrates practical applications of the Smart City concept in a specific urban context, to specific policy challenges, with specific technologies in use. Practitioners gain from this an instructive overview of current developments and potential inspirations.

Q3: What factors and mechanisms increase the success of Smart City projects?

This explanatory question identified projects' success paths - configurations of factors and their interrelations (mechanisms) that increase the possibility of making Smart City projects successful. This insight equips practitioners with a list of minimum conditions that have to be taken into account when designing and implementing effective Smart City projects.

SCOPE OF THE STUDY

The research scope followed the dual nature of the research questions that address both program and project level. The study's territorial scope covered cities with their functional urban areas in Visegrad Group countries (Czech Republic, Hungary, Poland, Slovakia) that use different solutions to serve people.

The unit of analysis for Q1 were strategic documents, while Q2 and Q3 analyzed projects nested in specific urban areas. Our study covered existing solutions in implementing the Smart City concept, developed beyond the concept phase, and implemented in V4 cities. The time frame covered by the study involves those solutions whose implementation or piloting has been closed in the period between January 1, 2016, up to the time of implementation of this current study (March 2021).

The thematical scope covered ten public policy areas as provided by Contracting Authority of this study: (1) city management, (2) business, (3) environment, (4) healthcare, (5) transport, (6) energy, (7) science & education, (8) tourism, (9) culture, and (10) water and waste management. They were further broken down into 56 subareas related to technologies applied in projects. They are presented in Annex III.

CHALLENGES

There were three substantial challenges for the conceptual execution of this project. The first challenge was the nature of the Smart City concept. It is multi-faceted, and the literature is populated with a number of, often competing, definitions. This variety in perspectives on the Smart City concept is mirrored in projects practice. Thus, to address this challenge, we proposed the analytical framework that allows grasping different perspectives and shows the various distribution of accents among aspects of the Smart City.

The second challenge was the unit of analysis. Terms of Reference focuses on strategic documents and projects as two units of analysis. However, Smart City projects are usually part of the broader system, a Smart City initiative that addresses the functional aspects of urban areas. Thus, we decided to apply a nested approach, putting particular projects and program documents in their urban context.

The third challenge related to the logic of comparison among projects. The Contracting Authority requested focusing the research on the population of projects that applies 56 different solutions in addressing challenges of ten different policy areas and coming from four different countries. The international and multi-sectoral aspects added to the complexity of comparative dimensions and created a highly diversified population with no common denominator. Such highly diversified projects could not be objectively compared with each other using standard evaluative criteria (utility, efficiency, etc.). Thus, we proposed three dimensions of Smart City (humana, automata and agora) as the highest common denominator to compare projects and identify good practices patterns.

1.2. METHODOLOGY

The Smart City is a multi-faceted phenomenon. There is no one dominant definition of the Smart City concept, while at the same time, there are competing ideas on Smart Cities.

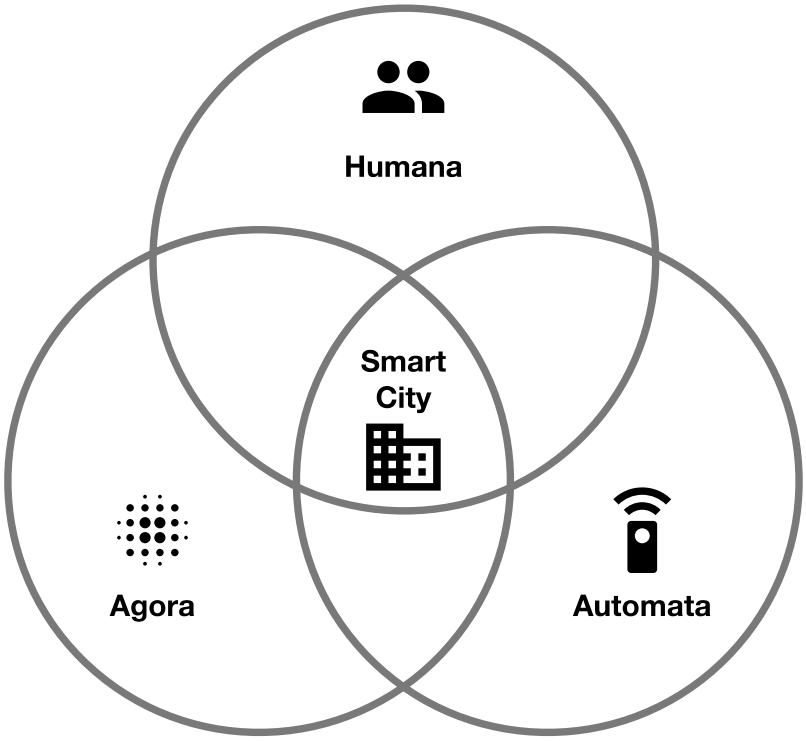
Therefore, as a starting point, we propose a broad definition that considers different pathways and models for the development of the Smart City, providing space for comparative analysis.

Smart Cities are urban environments where a digital approach to sustainable development has been introduced to reduce resource consumption, improve quality of life, and enhance economic competitiveness.

We follow this definition with a more detailed framework that allows bringing together different Smart City aspects. The framework does not impose one model of the Smart City. Instead, it will enable mapping the degrees to which an individual Smart City initiative borrows from different aspects of the Smart City phenomenon.

Our analytical framework consists of three dimensions: Humana, Automata, and Agora. They underlay the functional and human dimension, technological dimension, and collective dimension of Smart Cities (ref. Figure 1).

Figure 1. Analytical framework



Source: own elaboration.

HUMANA means that the project addressed specific urban policy challenges and target the needs of particular users (including people with disabilities and socially vulnerable groups). This aspect also covers an increase in the accessibility of a given public service through the implementation of the project. This dimension describes the purpose of public policy actions. It is linked to the utility, impact, sustainability and inclusiveness criteria of evaluation. It is grounded on the one hand in the classics literature on public policy and evaluation[1], and on the other hand, an emerging works on user-oriented policy design[2] and service design[3].

AUTOMATA means that innovative technology was instrumental in making change and executing the initiative. This dimension describes the means of public policy. It is linked with efficiency and effectiveness criteria of evaluation, and it is grounded in the literature [4] as well as in the official EU documents[5] on the use of information and communication technologies (ICT), integrated solutions and open data.

AGORA means a certain degree of stakeholders' involvement during the implementation of an initiative. This dimension describes the process of public policy. It is linked with the inclusiveness and sustainability. The spectrum of involved stakeholders could vary (NGOs, final users, public agencies, private companies, networks, etc.). Also, the degree of involvement and the moments of involvement could vary. As the literature suggests, co-production of public solutions can have a form of involvement in the design of the solutions, involvement in testing prototypes, financing the project, involvement in the delivery of the solution, and/or co-sharing of the project's data[6].

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[1] B. G. Peters, G. Capano, M. Howlett, I. Mukherjee, M.-H. Chou, P. Ravinet, Designing for Policy Effectiveness. Defining and Understanding a Concept, Cambridge University Press, Cambridge 2018;
P. Rogers, S. Funnell, Purposeful Program Theory: Effective Use of Theories of Change and Logic Model, Jossey-Bass, San Francisco 2011

[2] C. Bason (Ed.), Design for Policy, Gower Publishing, Surrey 2014

[3] L. Kimbell, The Service Innovation Handbook: Action-oriented Creative Thinking Toolkit for Service Organizations, BIS Publishers, Amsterdam 2015;
B.G. Peters, Policy Problems and Policy Design, Edward Elgar Publishing, Cheltenham, Northampton 2018

[4] R.P. Dameri, C. Rosenthal-Sabroux, Smart City how to Create Public and Economic Value with High Technology in Urban Space, Springer, 2014

[5] https://ec.europa.eu/info/eu-regional-and-urban-development/topics/cities-and-urban-development/city-initiatives/smart-cities_en [available: 27.10.2020]

[6] T. Nabatchi, A. Sancino, M. Sicilia, "Varieties of Participation in Public Services: The Who, When, and What of Coproduction|", Public Administration Review 77(5), pp. 766-776.

This Smart City dimension is grounded in the well-established literature on the co-production of public services[7], and an emerging body of evidence on collective urban policymaking and living labs[8].

We claim that an initiative to be recognized as a Smart City should touch upon all three framework components. However, it could include different degrees and configurations of each area. To put it simply, a project, in order to be recognized as a Smart City project, needs to: (a) aim at specific policy issues important for urban areas and targeting a concrete group of users; (b) apply technology as a problem-solving tool, (c) use a degree of co-production during its implementation (ref. Table 1).

Table 1. Dimensions of the Smart City project with definition and evaluation criteria

DIMENSIONS OF THE SMART CITY PROJECT	DEFINITION AND EXPLANATION	LINK WITH EVALUATION CRITERIA
Humana	Describes the PURPOSE of the project. The project addresses: (a) specific urban policy challenges and (b) target the needs of particular users (including people with disabilities and socially disadvantaged groups).	Utility criterion Impact criterion Sustainability criterion Inclusiveness criterion Effectiveness criterion
Automata	Describes the MEANS of the project. The project applies an innovative technology that is essential for making the solution work.	Efficiency criterion Effectiveness criterion

[7] E. Ostrom, "Crossing the Great Divide: Coproduction, Synergy, and Development", World Development 24(6), 1996, pp. 1073-1087; D. Sześciło, "Samoobsługowe państwo dobrobytu. Czy obywatelska koprodukcja uratuje usługi publiczne?", Wydawnictwo Naukowe Scholar, Warszawa 2015

[8] M. Hossain, S. Leminen, M. Westerlund, "A systematic review of living lab literature", Journal of Cleaner Production 213, 2019, pp. 976-988, G. Nesti, Co-production for innovation: the urban living lab experience. Policy and Society, 37(3), 2018, pp. 310-325

DIMENSIONS OF THE SMART CITY PROJECT	DEFINITION AND EXPLANATION	LINK WITH EVALUATION CRITERIA
Agora	Describes the PROCESS of the project. The project engages various stakeholders into various stages of the implementation process.	Inclusiveness criterion Sustainability criterion

Source: own study and literature review.

As concern the link of our framework with evaluation criteria, two things should be noted. First, all evaluation criteria are normative. But in our model, only one dimension – Humana - is normative while Automata and Agora are descriptive. That means that only in Humana's case, the more project is aligned with the users' needs, the higher is the quality of the project. Automata and Agora only describe the different ways and the extent to which technology is used, and cooperation is implemented. More collaboration or more technology does not necessarily mean the higher quality of the project. With that neutral framing of our dimensions, we will establish the configuration and degree of three dimensions that make the good smart city projects.

Second, the Automata dimension is an essential condition (*sine qua non*) that needs to be fulfilled to name the project as "smart." In other words, projects that do not have the technological component are not treated in our research as smart city projects.

We used our analytical framework throughout the whole project. For the analysis of strategic programming documents (research Q1), we followed this analytical framework to see what aspects are most common and how they are characterized in the programming documents and strategies related to Smart Cities.

For the research questions dealing with Smart City projects (Q2 and Q3), we translated the framework into a more detailed list of factors (templates for in-depth case studies) and used that list to identify the configuration of patterns that determines the success of Smart City project.

2. RESULTS

2.1. APPLICATION OF SMART CITY CONCEPT IN THE STRATEGIC DOCUMENTS

The application of the Smart City concept in strategic documents varies across V4 countries, taking into account the definitions, areas and dimensions discussed. Every country presents a different level of the concept maturity and a different approach (top-down, bottom-up, unified across the country or with room for autonomy of the city). Various additional activities are also being undertaken in this area.

The conclusions on the role of strategic documents drawn by the projects' stakeholders and by institutional respondents differ in their nature. For the owners and contractors of smart solutions the role of strategic documents was barely visible. On the contrary, representatives of partner ministries pointed out several success factors related to the strategic level: a uniform definition of the Smart City concept, a holistic approach, positive stimulation of participation and awareness of technical issues.

2.2. APPLICATION OF SMART CITY CONCEPT AT PROJECT LEVEL

The analysis of the case studies pool (ref. Table 2) led to useful conclusions concerning vital aspects of the solutions. For example, digital solutions applied throughout the V4 countries demonstrate a solid progress in the field, but they are hardly cutting-edge innovations. Interconnectedness is a very desired feature of an ideal digital solution.

Budgets of the projects are varied ranging from large infrastructural investments to universally affordable subscriptions or license fees. Public support was not commonly used to finance smart solutions in V4, but if the public support was included, most of projects were financed from EU Cohesion Policy. A smart solution can be financed at various stages, either development or implementation phase. Besides targeted financial support more conceptual expertise removing legal impediments and introducing some standardization would be required at national level. It was often mentioned that the funding works as an incentive. Projects which received public funding would not have ever been considered if it had not been for the funding.

Considerably more examples of smart solutions were identified in medium/large cities than small/medium cities. Not all smart solutions can be applied everywhere. Some products are only applicable in large agglomerations, while others work better in smaller cities.

Involvement of the institution's management is a necessary factor that increases a project's success. External participants quickly become discouraged with tedious processes. It is worth including them in exceptional and necessary moments of the process.

As expected, smart solutions turned out to be a useful tool in times of the pandemic (COVID-19), especially in health, public safety and digitally facilitated access to services whether public or private.

Table 2. Selection of smart solutions recommended as good practices in V4 countries

1. CITY MANAGEMENT	2. BUSINESS & ENTREPRENEURSHIP	3. ENVIRONMENTAL PROTECTION	4. HEALTHCARE	5. TRANSPORT
E-documentation, e-government C05 Golemio Prague	Circular economy P04/P46 Individual Waste Segregation System Ciechanów EXTENDED STUDY	Air quality monitoring technologies P57 Let's end with smog in Poznań	Remote emergency response systems C25 Zachranka EXTENDED STUDY	Intelligent transport infrastructure (car parks, PT stops) C15 Parking and traffic system Kvasiny plant
E-notifications and alerts P60 Smart City Poznan APP	Sharing economy P47 Mobility budget – Vooom	CO_2 emission control technologies P08 Vehicles for environmental protection Warsaw	Remote diagnostics and patient monitoring P70 Polish anti COVID-19 app EXTENDED STUDY	Traffic tracking and management systems H10 BKK Futar Budapest
Direct communication systems of inhabitants with local authorities P59 Urban Lab Gdynia EXTENDED STUDY	Data security systems P49 ChainDoc Toruń	Water quality monitoring technology P65 Microtox water biomonitoring Poznań	Health system e-documentation H08/H27 National eHealth infrastructure	Diagnosis systems of technical condition for roads and bridges S19 Meteostation in Prešov
Mobile applications activating residents P01 iVoting Jaworze	*Geofencing* for business P66 Placeme.pl	Sensors detecting leaks of harmful substances S09 Control of emission in US Steel Košice	Communication systems with doctors and consultants P67 Znanylekarz.pl (Known Doctor)	Toll collection and parking systems P62 E-control SPPN Warsaw

Systems for cybersecurity C26 E-services from Azure for Czech citizens'	Intelligent buildings S07 Lidl logistics center Sered	Environmental control systems H06 Tree register Budapest	Technologies for home medical care S14 Smart solution for seniors living alone	Autonomous vehicles for public transport H41 Automatic metro line M4 Budapest EXTENDED STUDY
Building security systems P71 BVMS for Polin Museum	E-Services for business C13 Data driven factory management Mlada Boleslav Skoda	Green buildings P09 Konrad Bloch Office building	Health care analysis systems P38 Visual Crowd Detector	
Incident Response Systems C01 Drones for IRS Pilsen EXTENDED STUDY	Chatbots and AI assistants P69 Chatbot Mat InPost	Recycling technologies S08 Žiar waste recovery center	Drones for the transport of blood and medical devices during accidents P39 aiRPAS Rescue	
6. ENERGETICS	**7. SCIENCE & EDUCATION**	**8. TOURISM**	**9. CULTURE & ACTIVISION OF INHABITANTS**	**10. WASTE, WATER & SEWAGE MANAGEMENT**
Smart Grid P50 Smart Heat Distribution Network Warsaw	E-learning H13 Mozaweb – digital school applications	Intelligent ticketing systems P23 Gdansk Resident Card	Technologies for the reconstruction of monuments in virtual reality S31 Spis Castle in VR	Technology for water storage P30 Intelligent retention system Bumerang Rzeszów
Energy storage H11 Geothermal smart district heating Miskolc	E-school management and e-registers C09 Smart keychain Kolin	Bots-guides H15 Pocket Guide EXTENDED STUDY	Augmented reality technologies (AR) in cultural facilities H38 Interactive elements in Castle of Gyula	Sewage treatment technologies C14 Sewareg recycle Prague
Charging stations for electric vehicles P18 E-public transport in Zielona Góra EXTENDED STUDY	Gamification technologies in education P21 Trashbusters	Interactive tourist routes P41 Your Warsaw 1918/2018	Intelligent infrastructure for disabled people P34 Totu Point Poznań	Flood control systems H40 Solar pump Kartya street Budapest
Intelligent urban lighting H12 Eclipse smart lighting system Szank	Interactive classroom equipment H14 Ujbuda education program Budapest	Luminous and multimedia visualisations S28 White nights Košice and Bratislava	3D visualisation technologies in museums S30 House of Marina EXTENDED STUDY	Water distribution systems C07 Smart water meters Brno

Photovoltaic systems P51 PV on 35 high-rise buildings Wrocław	Virtual student databases and educational progress analysis systems P68 Librus EXTENDED STUDY			Waste collection and sorting technologies S35 Who recycling more paying less

2.3. QUANTITATIVE COMPARATIVE ANALYSIS

Four conditions for project success taken into account in the Qualitative Comparative Analysis are especially important: CIT (The project supported by the city during implementation), STA (Engagement of other important stakeholders), FRD (User-friendliness of the solution) and EXP (Adequate explanation of solution to key stakeholders). The outcome may be observed for the four groups:

I. All four conditions are present (CIT,STA,FRD and EXP)

There are 15 cases in this group. One of the projects is the P04 Individual Waste Segregation System. Segregation of municipal waste in multi-family housing is a great challenge for local governments. The city (factor CIT) and the technological partner T-Master were engaged in introducing non-contact containers for waste segregation, which are very user-friendly (FRD). Its main advantage comes from the lack of anonymity – a unique code for each household to use the container was given and citizens were explained how to use the new system (EXP). The system was prepared in close cooperation with the company collecting waste and the estate administrator on which the containers were mounted (STA). The city receives information on how much waste is generated by residents and can take preventive measures to increase recycling levels. The system's operation has been called a great success by increasing the level of waste segregation from 10 to 90% and 83% of surveyed residents declared they would not want to return to the previous system.

II. CIT and STA are present (but FRD and EXP are not present)

One of 10 cases in the group is a project P01 iVoting Jaworze. The system provides two primary tools for voting through the Internet - poll and consultation -using blockchain technology. The application was designed by Carbonet Sp. z o.o.

More than a dozen scientists were involved in the work on the project, including those from the Częstochowa University of Technology, Wrocław University of Technology, as well as employees of several Warsaw universities (STA). Most of them deal with the subject of cryptography and blockchain architecture in their scientific work.

One of the success factors of the project was the personal involvement of the commune's head (Jaworze County) in the project and his desire to implement a modern

tool in the county, which in the long-run has a chance to become a norm when it comes to contact between the office and the residents. Those elements contributed to the positive outcome of the project.

III. CIT,FRD and EXP are present (but STA is not present)

Among 2 projects from the III group, there is P62 E-control SPPN Warsaw. The project's objective was to design and implement a remote system of verification parking fees in the city parking zone. Two electric cars (Nissan Leafs) equipped with cameras and sensors automatically scan the license plates of cars parked in the city parking zone to validate parking fees. The idea of the project was created by ZDM (Road Traffic Authority of Warsaw), developed and discussed during technical dialogue (CIT). The remote system of verification parking fees in the city parking zone is easy to operate by the ZDM (FRD). Key stakeholder employees had training sessions that allowed them to run the system without any problems (EXP). The system is plugged into the road management ecosystem and use data from parking payment systems, so the outcome was set as 1.

IV. STA,FRD and EXP are present (but CIT is not present)

The last IV group includes 2 projects. P51 Photovoltaic installation on 35 high-rise residential buildings is one of them. The project's objective was to reduce the costs of one of the most significant burdens for the residents: electric power supplying common parts of buildings. The Housing cooperative initiated the project – Wrocław-Południe – co-initiator and owner of the solution, while Talo Energy sp. z o.o. carried it out. Voivodeship Fund for Environmental Protection and Water Management in Wrocław (WFOŚiGW) provided Prosumer Program. It was an opportunity to fund the installation from its resources (STA). Consultations with residents were organized to convince them that it is worth investing in renewable energy technologies. The majority favoured the installation. Some even became ambassadors of the project (EXP). Nevertheless, the city was not directly involved in the project (no CIT). Those elements contributed to the positive outcome of the project, which is reducing the bills for energy consumption by common parts of building up to 85% and have an impact on the city environment by reducing CO2 emissions to the atmosphere by 600 t.

3. LESSONS FOR COHESION POLICY

3.1. KEY OBSERVATIONS COMING FROM THE STUDY

The comparative research conducted in Visegrad countries at project level and strategic documents level, allows us to put forward ten key conclusions.

(1) PECULIARITY OF SMART CITY PROJECTS

Smart city projects are substantially different in characteristic from standard public projects co-funded by Cohesion Policy. They can incorporate physical infrastructure or equipment for vehicles with devices, but core value of these projects is data - an intangible product. Thus, Smart City solutions should not be simply procured, but as IT projects they need to be managed in an unique way - connecting strategic vision and agile execution. This requires anticipation of high risk, highly-qualified and properly remunerated teams also from urban administration, which is particularly challenging for smaller cities. Those projects are also not as expensive as building standard infrastructure elements and can provide additional functionality for currently existing structures in the city.

Source: good practices analysis

(2) SOUND BUT NOT CUTTING-EDGE INNOVATIVE

The reviewed population of projects provides a spectrum of sound initiatives that address urban challenges with well-implemented technological solutions. However, it has to be pointed out that these good practices are not breakthrough, cutting-edge innovations. Those solutions with similar functionalities were already implemented in other parts of Europe and the World and often procured as ready-made solutions formed by multinational companies. Thus, smart cities projects in V4 look rather as urban standards than pioneering attempts.

Source: good practices analysis

(3) STRATEGIC LEVEL INVISIBLE TO OWNERS AND CONTRACTORS

The role of strategic documents was unclear to the stakeholders of smart solutions. None of the respondents (owners or contractors) pointed out during interviews that the provisions facilitated or hindered the project realisation. The documents served as guidelines what to do and what to finance it with.

Source: strategic documents review, good practices analysis

(4) LACK OF HOLISTIC SUPPORT OF SMART CITY INITIATIVES

Holistic, national approach to the Smart City concept was mentioned as one of the success factors of solutions development. Lack of a central institution distributing funds and providing knowledge may significantly hinder the development process. It was often stated that the distribution of funding among cities of different sizes has been uneven. Only biggest cities, which are financially and mentally capable of implementing a smart solution anyway, have benefitted from the Smart Cities support programmes.

Source: strategic documents review, good practices analysis

(5) TYPES OF PROJECTS: SCOUTS VS. MAINSTREAM

We observed two types of projects in the reviewed population. First are the initiatives that are pilots, which means that they are developing a pilot solution. We call them "scouts" since their goal is to explore and test possible directions of application. The second group is initiatives that are scaling up or mainstreaming already developed solutions. We call them "mainstream" since they aim to fledge the solution in the specific urban area fully.

Source: good practices analysis

(6) CONFIGURATIONS THAT LEAD TO ECOSYSTEM

All reviewed projects were examples of good smart city projects. However, in our research, we were especially interested in those projects that become functionally plugged into the urban ecosystem. We have identified three configurations of factors that make a good smart city project plugged into an urban ecosystem:

- The project should be supported by the city during implementation AND the engagement of important stakeholders should be present;
- The project should be supported by the city during implementation AND the solution should be user-friendly AND purpose of the solution should be adequately explained to the key stakeholders;
- The project should engage important stakeholders AND solution should be user-friendly AND solution should be adequately explained to key stakeholders.

Source: QCA

(7) TECHNOLOGY LIKE LEGO BRICKS

Several interviewed practitioners raised the issue of a modular approach to technology. Basically, they see smart city solutions as built from smaller technology components, like “Lego bricks” that can be composed in different ways and replaced with new but compatible elements. This idea tries to address at least two challenges of smart city solutions. First, it allows avoiding overall dependence on one technology provider. Second, it allows for adaptation to technological developments and progress, and not being locked in in an obsolete solution. In that context, interviewees pointed out the role of the public administration (central level) in providing standards and compatibility across projects and city locations.

Source: good practices analysis

(8) LACK OF UNIFORM DEFINITION

Existence of a uniform definition of a Smart City (codified in a strategy or a legal act) was mentioned during interviews as an undeniable advantage for the development of the concept. In some countries the projects which obviously can be qualified as smart are not called that way and as a result the funding possibilities are unclear.

Source: strategic documents review

(9) LEGAL REGULATIONS ARE BARRIERS

Regulations limits possibilities for introducing new installations, applications and services. Industry-specific regulations (regarding e.g. spatial planning, engineering, public transport) contain standard catalogue of solutions that have been implemented for several decades and sometimes leave no room for innovative solutions or require special adaptation. For this reason, implementation of solutions take more time or even cities resign from taking up of some Smart City initiatives.

Source: good practices analysis

(10) SMART CITY IS IMMUNE TO THE PANDEMIC

The pandemic generally did not affect the operation of the systems and their effects are also ensured during time of remote work. Inhabitants, by using digital services, can even faster adapt to a changing reality. At this point, it is necessary to distinguish solutions providing remote diagnostics, which allow to minimize interpersonal contacts.

Source: good practices analysis

3.2. LESSONS FOR NATIONAL STRATEGIC PLANNING

The key recommendations from the study for the national governments are described in Annex VII. They include five main observations.

(1) PROVIDING COMPREHENSIVE SUPPORT

Support of Smart City concept development should not be a typical Cohesion Policy CAPEX support. Development of local supply by private sector and competences of public administration are the key to the highest levels of innovation. Smart City support needs to include improving competences in cities, including trainings, study visits, pilots or co-financing teams. Implementation of solution could be supported by special unit responsible for Smart City at national and local levels. Standards of digital public services and delivery of Smart City solutions should be also worked out. Support should be proceeded for more innovative and customized solutions that from V4 ecosystem solutions would be exported, not just bought ready-made solutions.

(2) MORE FLEXIBLE FINANCING

Local supply of smart solutions may be developed by investment funds, accelerators or incubators, but also by proper scale of public procurement – not too big, but also not too small. As they are often projects of high risk, they require more flexible financing measures, such as conducting pilots, implementing projects by partnerships of cities or even capital entries. This could be achieved e.g. by a dedicated financial instrument that would finance and coordinate cooperation between developers and the cities in the pilot phase of new solutions.

(3) EQUALIZATION OF FUNDS DISTRIBUTION

Support should be targeted both to metropolises and small or medium-sized cities. However, actions in both areas should be different. Large cities areas can handle simple Smart City projects, so for them innovative initiatives generating new solutions should be additionally supported. This could be provided by network work, know-how exchange or outsourcing of some tasks . In case of small or medium-sized cities support should focus on implementation of already well-known solutions that have been successfully implemented in other areas. Smaller authorities should also cooperate with each other and create common competence centres in order to achieve a proper critical scale. One of the important factors during implementation, which should be always addressed is promotion of the project, especially in small community.

(4) LEGAL REGULATIONS FLEXIBILITY IS NECESSARY

There is necessity of conducting separate benchmarking with the best countries in the world in case of implementation of Smart City concept, especially regarding flexibility for new solution implementation. This process in specific areas face legal barriers, which have not been resolved in the countries of the V4 group – in each country cities act differently to implement a specific solution. Although, it must be reminded that there are also significantly different legal contexts among countries outside of Europe.

(5) FURTHER BENCHMARKING WITH WORLD LEADERS

Benchmarking within the V4 countries has not provided enough detailed information on effective Smart City ecosystem support by national governments, both in terms of legislation (see above), as well as of organisation and financing measures. Therefore legal and organisational systems of Smart City leaders like Singapore, South Korea, Finland or Switzerland could be researched and compared with V4 group solutions, in order to find further operational recommendations.

(6) PROPOSITION OF SUPPORT TOOLS

Current support programmes were defined as not sufficient for appropriate development of Smart City concept in Polish cities. 10 new support tools, which should be run within EU Cohesion Policy, were proposed. Among them are: network of Urban Labs, pilotage of preparation of Smart City concepts in cities, Smart City contact point, creation of universal Smart City solutions, investment fund in Smart City start-ups, STEP programme for Smart City, additional points in assessment of smart solutions during application for funds, Gov-tech for Smart City, Smart City academy and special microgrants fund. Descriptions of all propositions in details are covered within Annex VIII.

3.3. LESSONS FOR CITIES AND THEIR PROJECTS

Six key recommendations emerged from the study for the local authorities. They are described in details in Annex VII.

(1) MORE SUSTAINABLE PROJECTS THROUGH BETTER INTEROPERABILITY

One of the important digital aspects brought up by the experts interviewed in this study rests upon the interconnectedness of technology (mostly referring to software) applied in the project. While this characteristics may not be applicable to all assembled case studies, it turned out to be significant in at least 15 good practices. This feature means that the digital solution co-operates well with the other systems in and ideally is built upon a modular structure that enables exchanging its old or inflexible modules to more functional ones. It prevents the technology from outdating and helps it evolve. Thus this feature affects the sustainability of the project rather profoundly. In doing so it may also prevent the unfavorable vendor lock-in effect in some cases.

(2) DIVIDING PROJECTS INTO SMALLER BLOCKS/MODULES/PHASES

It is recommended to divide projects into smaller blocks/modules/phases, because of the rapid technology development. Each module should be easily replaced by new solutions, so the standards for that should be specified and provided by the contractors.

(3) IMPLEMENTATION BY EXPERIMENTS, CONSTANT IMPROVEMENT AND CLOSE COOPERATION WITH PROVIDERS

Smart City projects are not just like infrastructure projects, so we can clearly specify all wanted elements and technologies. In most cases, cities are aware of the needs and functionalities that should be addressed by new solution, but cannot cover the knowledge about the technology and physical layer of solution. Because of that, new implementations should be conducted in form of pilotage, partnership or technical dialogue. Projects should never be closed, but constantly improved also by using options, supplementary orders and framework contract. SPVs and common development with private contractors are also good practices. Those element will increase the probability of projects success.

(4) IMPROVING USABILITY AND USER-FRIENDLINESS OF TECHNOLOGICAL SOLUTIONS

An important aspect of technological projects is making sure that technological solutions are created with the user experience. They should be easy and friendly to use. Lack of logic and complexity of interfaces is why a decrease in interest and use of digital services might occur.

Therefore, when implementing technological solutions, it is worth adopting an evolutionary approach consisting of testing and developing new solutions e.g., software versions on a small group of users, and then setting the project and successively expanding it on a larger scale.

Every innovative project should be implemented in 3 stages:

- designing and testing a prototype solution,
- experimental testing and improvement of the solution,
- implementation and development of the solution.

It is worth involving developers, technology experts, designers and UX researchers who will pay special attention to the usability and friendliness of different interfaces.

(5) INVOLVEMENT OF DIFFERENT STAKEHOLDER GROUPS

Decision-makers

An appropriate level of involvement of the institution's management is a necessary factor that increases a project's success. The presence of management representatives in projects greatly facilitates and accelerates their implementation. We suggest that representatives of the institution's management act as patrons of technology projects; it is worthwhile for them to be included by the content team at crucial moments of project implementation, such as inauguration, critical decision-making, elimination of management barriers, and promotion.

Users

Involving users in the planning and implementation of technology solutions is vital because it ensures that the users' perspective is included in new technology solutions, which increases the chance that they will be positively received in a broader scale. Users should be involved in every technology project at three stages:

- in the case of the project, it is recommended to include users at the stage of designing the solution concept, verifying and consulting the appropriateness of solutions about the needs, expectations, and potential of potential users.
- at the stage of piloting technological prototypes of solutions, where users test the solutions and provide the necessary feedback to improve the solutions and prepare them for implementation
- at the implementation stage, it is worth providing a help desk facilitating communication with the users.

At the design and pilot stage, the involvement of participants in the project should be judiciously estimated.

External participants quickly become discouraged with tedious processes. It is worth including them in exceptional and necessary moments of the process.

(6) IMPROVING THE COMPETENCE OF OFFICES TO IMPLEMENT TECHNOLOGY PROJECTS

In the face of challenges related to staff competencies, migration of specialists to the private sector and siloed organizational structures, we recommend two types of actions:

- the implementation of consulting and training projects in the form of *learning by doing* (gov-tech or gov-lab) by carrying out a technology project from identifying the problem to planning and implementing of the projects. It contributes to improving the competence of officials, development of a path for the Tech projects implementation and use of technical dialogue procedures in the procurement of technology.
- In the training and advisory process, apart from employees of digitalization departments, employees of other units should also be involved to spread the knowledge about the application of technology in the whole organization and not only in one team. This approach helps to overcome the resistance against new, modern way of doing standards task. This fear appeared in iVoting in project among the officials that need to learn a new attitude for consultations.

It is also worth realizing that public organizations may not always be adequately prepared for efficient and independent implementation of complex technological projects despite training and advisory activities undertaken. In projects financed by the cohesion policy, it is worth allowing the possibility of funding the costs of technical advisors - IT specialists cooperating with offices to implement e-services. Such support would be an essential solution, especially for smaller offices.