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NATIONAL UNIVERSITY
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FACULTY OF ECONOMICS

NORD
UNIVERSITY

BUSINESS
SCHOOL

MASTER THESIS

SMART CITY DEVELOPMENT UNDER THE WAR: HOW TO FIND A BALANCE BETWEEN SECURITY AND RESOURCE-SAVING? THE CASE OF KYIV

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Kyiv 2023

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LIST OF ACRONYMS

CGR — Collaborative Governance Regime

EU — European Union

IDPs — Internally displaced persons

IMDA — Infocomm Media Development Authority

ICT — Information and communication technology

KCSA — Kyiv City State Administration

PPP — Public-Private partnership

SMEs — Small and medium-sized enterprises

PREFACE

One of the most important things in my life is this master's thesis. This marks the conclusion of my studies in public sector finance at Taras Shevchenko National University in Kyiv (Ukraine), and Nord University in Bodo (Norway). In the last months of my education, I had my two years' worth of information assessed and emphasized.

I am fortunate to be surrounded by individuals who support and motivate me as I pursue my studies on the difficult subject of the War in Ukraine. I would want to use this opportunity to offer my sincere thanks to everyone who has made a major and important contribution to my research effort.

I want to start by thanking Olga Iermolenko and Nataliia Miedviedkova, who were my supervisors. They carefully studied each word of my work and offered sound scientific counsel, but they also became real inspirations and motivators for me.

I want to express my gratitude to every one of my interviewees for their time and effort in sharing their insights, which has significantly advanced the field's scientific understanding. They could demonstrate the true information, which is not available in textbooks.

I also like to thank all the professors and personnel at the universities indicated, as well as Anatoli Bourmistrov and Igor Lyutiy, who are the coordinators of this double-degree program. They have produced intriguing opportunities for everyone who wants to grow in the field of public finance with such a distinctive educational program. This program served as a fantastic motivation for me to advance in a number of ways.

Without a doubt, I want to thank my family, who have always been by my side and encouraged me in all of my endeavors, which are reflected in the results of this work.

Mykhailo Sharkov
15.05.2023

ABSTRACT

In recent years, smart cities have gained more and more popularity and many scientists are involved in research on smart cities. At the same time, developing "smart" cities in peacetime and wartime is different: in conditions of danger, the developed structure of the city can help its residents, which is what the "smart" city is focused on in its human-centric approach. The human-centric approach means that technology and data can be used in the interests of citizens, in contrast to the techno-centric approach, which provides that a “smart city” is a way of organizing the functioning of a city through advanced information and communication technologies.

Therefore, projects that increase the safety of citizens and provide equipment for shelters or their modernization are extremely important in war conditions. Equally necessary due to damage to energy infrastructure facilities are energy conservation measures. Therefore, this study investigates the case of Kyiv’s “smart” city development in the conditions of war and discusses possible ways to balance human security and resource conservation. Much of my research is devoted to measures to achieve a balance between security and resource-saving in a smart city during the war and help IDPs meet their needs and solve their problems.

An interview method was used to gather primary data for this research. It was however complemented by the analysis of different presentations and official documents available, as secondary data sources. I have collected five interviews with smart city development specialists and KCSA officials during the spring of 2023. The research period was set to coincide with the start of a full-scale conflict in 2022.

The study revealed that after russia's full-scale invasion of Ukraine in 2022, the priority of Kyiv Smart City development is not a technocentric approach, as it was before the war, but a human-centric one. In this work, I also focus on a group of people - who have suffered the most, these are the malware. Moreover, it was amazing, that the private sector assisted the local administration during the most difficult and uncertain month of the conflict. To study the case, Collaborative Governance was used as the conceptual framework.

The study of smart city development includes (1) how is the smart city of Kyiv project influenced by war, (2) how to achieve a balance between security and resource-saving in a smart city in the war, and (3) how can smart city development help IDPs meet their needs and solve their problems. The study reveals ideas about smart city development caused by the war, which led to ambiguous results. Therefore, the study complements the debate on providing security and resource-saving, as well as helping IDPs during the war.

Keywords: smart city, PPP, security, resource-saving, IDPs

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INTRODUCTION

1.1 Relevance of research, key definitions and problem statement

The purpose of this master thesis is to analyze how the smart city of Kyiv project was influenced by war and ways to balance security and resource-saving, taking into account the needs of citizens.

In accordance with European Commission, a smart city is a location in which existing networks and services are made more effective via the use of digital technologies for the benefit of its residents and businesses (EU, n.d.). This definition requires more detailed scientific study and clarification to answer key questions.

The term "smartness" encompasses more than simply streamlining city operations or incorporating digital interfaces into conventional infrastructure. It is also about purposefully utilizing technology and data to improve life quality and make better decisions.

The concept of a "smart city" and its implementation are two sides of the same coin. The term “smart city" often refers to cities that use digital technologies to solve urban problems. However, the evolution of smart cities goes beyond the technical aspects. According to Praharaj et al. (2018), the idea of smart cities is becoming increasingly popular as a way to alleviate urban issues and as a platform for encouraging urban innovation.

Focusing on how the Smart City concept can be understood as the assessment and use of a new set of emerging technologies that can effectively address the requirements and needs of citizens. The government, private institutions, and organizations should plan the strategy towards a new concept of Smart City and highlight innovation as a prerequisite for both technical and managerial perspectives Computer technologies are expected to play a key role in smart city development.

The following three criteria have been used in the literature to define smart cities: smart people, smart technology, and smart collaboration (Appio et al., 2019; Baron, 2012; Meijer and Bolvar, 2016). There are two approaches based on this classification: human- and technology-centric. A human-centric approach means that technologies and data can be used in the interests of city residents, in contrast to the first, which suggests that a smart city is a method of organizing a city’s functioning through cutting-edge information and communication technologies. But, simultaneously, these two approaches are difficult to link.

The relationship between smart people and municipal governments can be altered by smart technology. Through interactive mobile apps and social media, constituents can have two-way conversations with public agencies and officials. Using public feedback as the foundation for ongoing system

enhancement, cities can use technology to gauge public opinion on a variety of topics. Smart city initiatives must therefore be open and accountable to the public and securing community buy-in can be accomplished by engaging residents from the beginning.

The advantages of using a smart city can be many, e.g.: the use of alternative energy sources, the modernization of an outdated metro system, the reduction of expenses of the population, full automation of the city, control of all areas, and the progressive field of medicine (Kasych et al., 2017).

But another focus on the smart city allows us to determine the disadvantages of implementing innovative technologies in cities: this is a technological problem of modernization, financial expenses of citizens for the modernization of housing according to new housing standards, the likelihood of personal data theft, accumulation of all data in one "hands" (Vyshnevskyi et al., 2018).

The paper titled «The truth about smart cities: «In the end, they will destroy democracy» was written by Poole (2014). The author is skeptical about smart cities and believes that "a smarter way" to develop cities would be for architects and urban planners to work with psychologists and ethnographers. That would undoubtedly be one method of gaining a better understanding of what technologists refer to as the "end user" ― in this case, the citizen. Otherwise, a smart city will not be oriented to citizens and a democratic process, which includes joint management, discussion, and the implementation of citizens' ideas.

According to Ruhlandt (2018), "smart collaboration" refers to the involvement of a wide range of stakeholders, including citizens, in city governance. To address wicked urban issues like population health, pollution, and climate change, "smart collaboration" specifically calls for local governments to collaborate with businesses (Koppenjan et al., 2004).

Urbanization is one of the reasons for the need to develop a smart city. It is a never-ending process that is anticipated to reach 68% by 2050 given that 55% of people worldwide live in cities (World Cities Report, 2022). In order to keep up with the rapid growth that is putting a strain on the resources of our cities, providing sustainability on a social, economic, and environmental level is more crucial than ever before. Consequently, over 190 nations have agreed on goals for sustainable growth and smart city technology is necessary to accomplish these goals (Motius, 2018). Among other things, in the past few years, the issues of organizing space in the metropolis, as well as improving the quality of life, have become relevant.

Quality of life can be measured in many ways, such as how clean the air is and how safe people feel on the streets. The McKinsey Global Institute's report looks at how dozens of digital applications address such real-world and very human issues. It finds that smart technologies can help cities improve some important indicators of quality of life by 10 to 30 %, such as the following: cities can use

applications to combat crime and enhance other aspects of public safety; technologies for smart cities can speed up and make daily commutes less annoying; better health can be sparked by cities; smart cities can make the environment healthier and more sustainable (McKinsey, 2018).

The idea of smart cities is becoming more and more popular as a way to deal with urban issues and as a place to encourage urban innovation (Han & Hawken, 2018; Praharaj et al., 2018). The social, economic, and geographical factors of the setting in which each smart city application is employed decide how far we may go. However, there are additional factors to consider: good management and sufficient financial resources, and technology is only as effective as the entity that puts it to work.

It is well known that the public sector suffers from infrastructure issues, but the local government does not have to be the sole financier and operator of every infrastructure and service system. While the majority of applications would be implemented by the public sector, private actors could contribute the majority of the initial investment.

To make a smart city, authorities, designers, and technologists should concur that each city will require an alternate methodology. Firstly, city leaders are accountable for being good stewards of taxpayer funds because city budgets are typically constrained. As a result, numerous municipalities and cities already operate at a deficit and lack the funds to invest in large-scale infrastructure projects. For instance, Fishman & Flynn (2018) found that only 16% of global cities are able to self-fund smart city projects.

Secondly, most governments do not maintain a seamless flow of information and resources between government departments and the public and private sectors. According to Shelton et al. (2014), the existing literature relating the smart city concept to bureaucracy makes the assumption that tensions may develop during the implementation of the smart city because the actors, ideologies, and infrastructures of bureaucracy are not always as flexible as those in generic and rhetorical policy documents.

1.2 The uniqueness and need for research on smart cities under extraordinary conditions

The war in Ukraine has led to new challenges for the smart city of Kyiv since in the 21st century there is no experience of other countries that successfully resisted them. But, at the same time, there is the experience of other countries that have successfully coped with different types of disasters. The common thing is that Ukraine and these countries also faced unforeseen circumstances. And these countries have been able to build their smart cities in such a way as to ensure the protection and safety of residents. These countries have experienced catastrophes and therefore lessons for Ukraine can be learned from their experience: how a smart city can protect citizens during a war, and prepare for unforeseen circumstances in the future.

My topic is unique and interesting because I consider two opposite things: on the one hand, new smart city technologies that provide for growth and development, and on the other hand, the negative impact of external factors (in my research, I study the development of smart city under the war conditions in Ukraine), that are destroying these smart cities. But, at the same time, war can also be a motivating factor in the development of new technologies to counter subsequent negative factors.

My idea is to consider the concept of a smart city, its principles, participants in urban planning, and the changes caused by the war; what needs to be done in order to ensure security (first of all, people's lives) and at the same time save resources (energy saving, saving financial resources, etc.). This is challenging, but possible by doing a detailed analysis of Ukrainian practice and world experience of the smart cities' creation.

Moreover, economic turmoil gives impetus to the development of smart cities and ensures the safety of citizens. Thus, the situation in the world sometimes dictates the rules of the game for the development of "smart cities", therefore, with the start of the coronavirus pandemic, the medical sphere became relevant for smart developments: because of the war, Ukraine faced unprecedented destruction of infrastructure. In the first 100 days of the war, the invaders destroyed and damaged 256 enterprises, 656 hospitals, 1,177 schools, and 668 kindergartens. Many people were left homeless or forced to leave their homes because of the danger. Thus, to date, a large number of IDPs have been recorded in Ukraine.

Nowadays, more research suggests focusing specifically on smart city development approaches, while in times of war, smart cities can have a positive impact on solving the problems of citizens, especially those who need help the most. That is why, I also planning to study is how can the smart city help IDPs meet their needs and solve their problems.

1.3 Structure of research

The key questions of my master's thesis are as follows:

1. How is the smart city of Kyiv project influenced by war?

2. How to achieve a balance between security and resource-saving in a smart city in the war?

3. How can smart city development help IDPs meet their needs and solve their problems?

This master's thesis is divided into eight sections and includes a prologue, abstract, contents, bibliography, and appendices. The introduction emphasizes the need to research smart city development in general, as well as in the context of Ukraine, and poses research topics that served as a broad idea for this master thesis.

The theoretical section sheds light on the topic through a review of the literature, as well as theories and approaches to the development of smart city concepts, international experience of ensuring the security and resource-saving of smart cities in disasters, and methods to save financial resources of smart cities in disasters. This component of the master thesis is reinforced by the selection of conceptual and theoretical frameworks for future study, which will aid in the theoretical explanation of the processes occurring in the research object.

The next part discusses the approach that was utilized to perform this investigation at a high scientific level, revealing what procedures were employed and what resources were utilized for the project. At this point, the plan for future research is agreed upon, including which stages will be conducted and which ethical standards should be observed during the research.

It was also determined to highlight the study's broad context in the fifth chapter, which aided in gaining a comprehensive awareness of the context, or environment, in which the object of study resided. This stage of the research may be referred to as the preparation for the major section of the study, which created a general grasp of the processes that exist in Ukraine. The primary demand in the future will be the verification and inclusion of this information during the research.

The findings of an extensive investigation are reported in the sixth chapter of the text, titled "Empirical Findings." In this section, I attempted to provide as much information as possible so that the reader has a comprehensive image of smart city development in Ukraine during the war, which will aid in answering the key issues addressed in the first part of this master thesis.

The following section discusses the contributions and answers to the work's main question, provides a clear understanding of the issue of smart city development as it exists in Ukrainian practice, intertwines with the theoretical foundations already covered by previous scholars, and proposes new theoretical additions and practical improvements for smart city development in Ukraine.

The last component of this master thesis offers study results and current constraints that may serve as ideas for future research.

II. LITERATURE REVIEW

2.1 Theories and Approaches to the Development of smart city concept

The Smart City concept was developed in the early 1990s to demonstrate that urban development is becoming increasingly dependent on technology, innovation, and globalisation, particularly from an economic standpoint (Vishnivetskaya and Alexandrova, 2018).

Though the term "smart city" is widely used around the world, there is no single definition. However, the interpretation of this concept may vary across countries, organisations, and scientific literature.

Thus, IBM Company, one of the primary authors of smart city solutions, explains it with three main quality indicators: provided, related, and intellectual.

Meijer et al. (2016) categorise options based on three fundamental characteristics of smart cities: smart technology, smart people, and smart governance. Hollands (2008) emphasises the significance of inputs from and interactions between diverse stakeholders and technology, whereas Giffinger et al. (2007) identify six key aspects of smart cities: smart transportation, people, economics, governance, lifestyle, and the environment. Although Meijer et al. (2016) warn against combining smart city features such as smart technology, people, and governance with smart city goals such as smart mobility, living, and economy.

According to IMDA, a smart city is "a village, district, city, region, or small country that uses information technologies with real-time analysis to promote sustainable economic development" (IMDA, 2012). Meijer et al. (2016, p.398) formulated an approach that focuses on the person: a smart city is “ability to attract human capital and to mobilize this human capital in collaborations between the various (organized and individual) actors through the use of information and communication technologies”.

According to the European Parliament, a "smart city" is one that uses information and communication resources to solve social problems. The EU is certain that such cities have strategic importance in terms of poverty, inequality, and the fight against unemployment, as well as effective management of energy flows. According to the EU, smart cities are "city areas and communities established on the basis of existing strong parties and assets, as well as established on new opportunities improved through better use of digital, telecommunication technologies, innovations, and knowledge in which traditional and new network and services exist."

Over the last decade, urban concepts have become more sophisticated and widespread, particularly in urban planning.

In Europe, there are various schools of thought on how to define the Smart City:

1. There are those who identify the smart city as a city of advanced technology, where it appears that in this field, information and communication technology will play an indispensable role in achieving a smart city with advanced technology and competitive in the global scene, as modern technologies applied to the city is an element. Allows for the construction and restructuring of an urban environment in which data and information are exchanged, retrieved, and processed in real-time to provide real-time solutions.

2. The second definition is a city capable of managing available resources in a smart and connected manner, i.e., improving quality of life is a central factor and a common goal of the definition itself.

3. The new dimension that completes the intelligence that ensures the development of the city in terms of the sensitive city: The city should not only be smart, but smart to all of its citizens; however, if the city is smart, investments are directed in human and social capital, participation processes, and technological infrastructure to ensure sustainable and competitive economic development, high quality of life, and responsible management of natural resources.

Thus, the first definition is connected with technology, the second one ― with managing available resources, and the last is focused on citizens.

There are many building steps in the smart city concept, such as smart energy, intelligent transportation, intelligent home, intelligent health, intelligent waste management, intelligent noise control, intelligent way of checking air quality, food, and water tracking system, and intelligent security. Smart energy is an innovative way to distribute and store energy, as well as monitor the network and communications (Mir and Ravindran, 2017).

2.2 International experience in ensuring security and resource-saving of smart cities under the disasters

Cities are experiencing significant population expansion, increased stress and economic constraints. Cities must discover ways to increase efficiency and cut expenditures while maintaining a high quality of life for their residents in order to remain competitive and achieve sustainable growth (Carbonnell, 2015).

When experts gather to debate the way to smarter cities, Medellin (Colombia) frequently comes up as a criterion by which any city's transformation ambition should be measured. Many cities throughout the world experience this sense of urgency after an economic calamity (Detroit, USA), civil war (Kigali, Rwanda), or environmental disaster (Christchurch, New Zealand, and Tokyo, Japan) (Cathelat, 2019). All this experience includes creating maximum security for a comfortable living, as well as ways to save resources (Table 2.1).

Table 2.1. International experience of a smart city under the disasters

City/Country	Problems caused a security risk	Solutions to meet people's needs	
		Solutions for providing security	Solutions for resource savings
1. Kigali (Africa).	country's civil conflict	− establishing competent and professional security organizations; − sensor-based data; − drone delivery services	− initiatives have been implemented to bring technology and people together; − establishment of green and smart building labs; − energy resource management system;
2. Medellin (Colombia)	unemployment, criminality, and alarming murder rates	− programs were established with the aim to combat catastrophic flooding and mudslides; − using smartphone apps to enhance sensor data with their own observations and photographs of possible threats	− hyper-modernization and automation paradigms; − methods to incorporate technical and social development into an overall improvement in daily life
3. Tokyo (Japan)	repeated natural disasters	− core concepts of urban design are centred on security, energy efficiency (appropriate use of electricity, economy), and pollution removal; − buildings that are 95% or more earthquake resistant; − construction of new buildings with more damage-resistant materials; − each house is outfitted with special beacons and alarms to warn citizens of an earthquake.	robotic systems that aid in the logical use of resources in the face of natural disasters
4.Christchurch (New Zealand)	earthquakes	− EQRNet, the technology that improves decision-making in the aftermath of an earthquake (the smart system depicts the impact of an earthquake on each building in the city in great detail)	it transforms the city into a testing ground for technological innovation

Source: Mace (2017); Davis (2017); Rich (2017); Veselitskaya et.al. (2019); SmartCity Press (2018)

1. Kigali (Africa). Kigali is Rwanda's capital city, located in the country's center. The Kigali Genocide Memorial commemorates the 1994 mass executions in Rwanda that were linked to the country's civil conflict. Nevertheless, Kigali, Rwanda's capital city, was named the safest city in

Africa in 2022. It received a safety index score of around 75.7, making it the African city with the lowest crime incidences

The fact is that Rwanda has made significant efforts to ensure the security and safety of the country's territory by establishing competent and professional security organizations. Furthermore, the country has highlighted information technology as a crucial engine of economic growth.

In 2013, the government released its Smart Rwanda Vision Statement, which aims to move the country into a "knowledge-based society" as part of the larger Smart Africa Manifesto. The larger program assigns specific African nations the responsibility of developing IT concepts to increase the wealth and living standards of the continent's population.

Smart Vision has invested more than £500 million in 67 targeted projects. However, the total economic impact is anticipated to be $1.18 billion, representing a 142% return on investment. At the same time, the return on investment is heavily influenced by how citizens are integrated into smart communities that use new technologies (Mace, 2017). The Kigali experience teaches us the following:

First, the following initiatives have been implemented to bring technology and people together:

- Imagination Stations: People require a place to develop their thoughts, as well as the tools and financial support to put them to the test — that was the thinking behind the FabLab Kigali branch, which opened in Rwanda in May 2016 with the goal of "integrating hardware skills with software knowledge" and introducing Rwandan innovators to the rest of the world.

- The Impact Hub is a co-working facility and a conduit to international, like-minded thinkers that results in virtual global meet-ups. Edgy lectures by entrepreneurs and innovators held on a regular basis in an appealing rooftop venue assist local folks to connect in new ways to further creative ideas that will benefit the country (Davis, 2017).

Second, it is the establishment of green and smart building labs (where researchers can test smart solutions and which are also open to the public and accessible (e.g., schools)), with further integration into smart and sustainable communities. These necessitate engagement and community involvement in urban planning and decision-making, such as collaborative efforts to develop local economies, local resource management, and collaborative service provision (e.g., local community working hubs). Such smart and linked communities can significantly reduce resource use. This campaign can be supported by energy savings companies or by requesting businesses to install solutions for marketing purposes. However, some public funding is likely to be required.

The initiatives should be monitored and reviewed on a regular basis based on predetermined metrics and cost-benefit analyses of individual and combined solutions. Because of the costs and resources

required, these programs should be established as investor-based initiatives when possible, or as a public-private partnership, with local management and maintenance businesses incentivizing contractors and users to use services and resources more efficiently (Rich, 2017; Davis, 2017).

In turn, most of Kigali's projects are being implemented using the experience of Sweden. Its experience is instructive in this regard. The design of the neighborhood, which included the integration of technical infrastructure, mobility, communication infrastructure, and building infrastructure, cut energy consumption and waste dramatically. Thus, the positive results of Sweden are as follows: a large decrease in solid waste (90%), liquid waste (35%), energy usage (40%), and water use (40%) (Rich, 2017).

Third, among other key projects launched in Rwanda that can aid in the resolution of security issues while conserving resources, the following should be mentioned:

- Sensor-based data. The sensor data can be used to decide measures to be performed, such as dealing with water pollutants, warning people about flooding dangers, decreasing pollution effects by reducing car traffic at specified hours, or informing urban planning decision-making. Such maps and sensor data can also assist local governments in planning for resilience, determining the site of new developments and transport lines, and guaranteeing more diverse land use and optimal density. The data (taking into account safety regulations) can also be shared with individuals to assist them in making more educated decisions about where to live, work, and move in the city.

- Huza energy resource management system. Rwanda Energy Group is installing a new integrated business management system to improve customer responsiveness, reduce revenue leakages across the network, and standardize operations.

- Drone delivery services. In 2016, the Rwandan government, in collaboration with the California-based business Zipline, launched the world's first nationwide drone delivery program. The plan will provide medical supplies nationwide (Rich, 2017).

2. Medellin (Colombia).

Interestingly, most city decision-makers do not define a smart city in terms of technology first; instead, they define it as a society capable of coping with and overcoming hardship (Cathelat, 2019). This city may also be called a 'Resilient City', viewpoint and experience are unique to Medellin, which had to overcome a sociological tragedy.

In Medellin, the 1980s and 1990s were distinguished by unemployment, criminality, and alarming murder rates. In 1988, Time magazine called it the most dangerous city in the world. Despite its violent history, Colombia's second-largest city has become a global model of resilience and urban

regeneration (The Hague academy, 2023). Medellin has been recognized as a paradigm for successful local development by the Overseas Development Institute (ODI, 2023).

Experts agree that perspective was a vital component of Medellin's transformation: the city looked beyond technology as an aim in itself. Instead, it discovered methods to incorporate technical and social development into an overall improvement in daily life felt throughout the city — particularly in areas where improvement was most needed. Medellin's concept of itself as a smart city deviated from the normal hyper-modernization and automation paradigms.

A series of programs were established with the aim of combating catastrophic flooding and mudslides, including the installation of sensors on hillsides throughout the city to monitor rain, water levels, soil moisture, and soil movement. This gave earlier, more specific warnings of potential flooding and other disasters. Citizens in flood-prone areas could use smartphone apps to enhance sensor data with their own observations and photographs of possible threats. The information was utilized by planners to position drainage pipes and other conduits to divert excess rainwater away from risky regions (Freedman, 2019).

3.Tokyo (Japan). Improving citizen safety due to repeated natural disasters is a distinguishing element of Tokyo's urban planning. Tokyo's core concepts of urban design are centered on security, energy efficiency (appropriate use of electricity, economy), and pollution removal.

The Housing Master Plan Frequent earthquakes, as well as the aging of the population, prompted a rethinking of housing priorities. The primary idea of housing is optimum security to live and stay comfortably in the city. The plan is carried out by city officials, the Bureau of Urban Development, and building organizations, all of which are directed by the needs of citizens.

The "Action & Legacy Plan" was adopted in 2016, setting the priorities for Tokyo's growth until 2020. According to the proposal, the city will become more diverse, smart, and secure.

In the nearest time, city officials hope to have buildings that are 95% or more earthquake resistant. To enhance this amount, it is required to carry out foundation strengthening work as well as the construction of new buildings with more damage-resistant materials. In addition, for the citizens' protection, each house is outfitted with special beacons and alarms meant to warn citizens of an earthquake.

To mitigate the effects of natural disasters, the city employs innovative methods of training specialists. Specialists have access to models and simulators, as well as robotic systems that aid in the logical use of resources in the face of natural disasters and their effects.

Thus, the major drivers of Tokyo's development are the region's physical peculiarities, which

stimulate the development and implementation of new technologies and breakthrough technology solutions. Nonetheless, these geographical peculiarities influence the success of a city's development and might be a hindrance in particular areas (Veselitskaya et.al., 2019).

4. Christchurch (New Zealand). Christchurch, a relatively tiny city on New Zealand's South Island, was severely damaged by earthquakes in 2010 and 2011. The disaster devastated the city, claiming 185 lives, destroying numerous homes, and demolishing over 1300 buildings, including many of the city's heritage sites.

Since then, Christchurch has been planning for future earthquakes and moving ahead to rebuild the city into a smart, resilient city. It addresses issues such as climate change by transforming the city into a testing ground for technological innovation.

Until present, the Christchurch City Council has established 20 partnerships with the commercial sector, governments, community organizations, tertiary institutions, and volunteer organizations ─ both locally and globally ─ with the goal of realizing the smart city agenda.

The EQRNet Resiliency System is a significant undertaking that the city can be proud of. Since September 2017, the Christchurch City Council has collaborated with Canterbury Seismic Instruments on EQRNet, a technology that improves decision-making in the aftermath of an earthquake. The clever system depicts the impact of an earthquake on each building in the city in great detail.

EQRNet is equipped with over 150 ground-shaking measuring locations in Christchurch, as well as a processing system that compares each building's design limitations to the shaking beneath immediately. The final result is shared with building service managers and structural engineers, and the full city's data is promptly made available to emergency management teams.

EQRNet is a key tool for essential safety and commercial decisions following an earthquake. With real-time data on earthquake effects, the city can respond precisely to the right place at the right time, minimising interruption to businesses, schools, and the general public. Furthermore, EQRNet data can assist the city in gaining a comprehensive image of how different structures react with various soil types as well as different types and intensities of earthquakes.

The primary goal of EQRNet is to improve overall resiliency and the quality, response time, and public education surrounding seismic occurrences. It also seeks to provide a quick and simple visualization that speeds up construction inspections (SmartCity Press, 2018).

2.3 Ways to save financial resources of smart cities under disasters

Budget funds are limited in war conditions. That is why the projects that are being implemented require additional funding from the private sector. When attracting private capital, part of the budget funds is released and can be used to implement strategically important smart city projects.

Public-private collaboration is consistently cited as an essential characteristic of "smartness" despite the variety of smart city definitions. According to Meijer & Bolvar (2016), the transformation of government brought about by this collaboration is frequently regarded as both a requirement for and a benefit of smart city development.

As a result, the strategy for the transition to smart cities means involving the private sector in order to complement public sector efforts with funding, technical expertise, and innovation. According to Ros-Carmenado et al. (2016), it is also believed to have overcome the social and technical difficulties associated with natural resource dynamics and rural development projects.

Despite the fact that merging these two unique components might be difficult in practise, PPPs can help cities pay for initiatives such as smart lighting and ensuring that programmes are finished on time and under budget. There is a lot of variation in how projects are managed within cities and how representatives from the private and public sectors collaborate when smart city initiatives are launched.

The local government is not obligated to fund and run all services and infrastructural systems. While the public sector would install the bulk of the applications, private actors may provide the majority of the initial investment. Only public goods that must be provided by the government may be funded by the government. Furthermore, more than half of the initial public-sector investment would provide a positive financial return, opening the door to collaboration.

Adding more actors to the mix is beneficial because it increases adoption and allows for greater creativity with the available data. When private-sector innovations evolve naturally, the government may regulate, convene important actors, grant incentives, or change buying decisions. Instead of master planning, some cities promote themselves as ecosystems, organising consortia and even physical cooperation spaces. (McKinsey Global Institute, 2018).

2.4 International experience in supporting IDPs

Most smart city apps would naturally belong to the public sector, but most users might come from the private sector. It makes sense to look for areas where private businesses, state-owned utilities,

universities, foundations, and non-profits can step back and play a role. According to McKinsey (2018), adding more actors to the mix boosts adoption and creativity with the available data.

Because of the current situation and a number of shared challenges with other Arab countries, the Syrian Arab Republic has not embraced the concept of smart cities:
a) insufficient long-term financial investment in smart city projects;
b) political insecurity and a high rate of youth unemployment;
c) inadequate ICT infrastructure; technological obsolescence;
d) difficulty in citizen adaptation to new modes of service delivery (Wafula, 2016).

The majority of Lattakia remains secure, but the presence of many displaced people has increased competition for services, assistance, and livelihood opportunities. Although the province still has the lowest food prices in the country, 330 thousand people in need of food aid have been identified in areas covered by MSNA in Lattakia, due to its relative stability and availability of services, stable areas in the governorate's centre and south have seen a large influx of displaced persons. Most estimates place the number of IDPs between 580 and 760 thousand, with the Syrian Arab Republic hosting 7.6 million.

According to the MSNA, there were 450 thousand of IDPs in rented housing, 220 thousand living with host families, and 23 thousand in camps, outnumbering the city's total population of 1.2 million, implying that the number of displaced people outnumbers the number of local residents in Lattakia. (Report, 2015).

It is critical to recognise the gaps in the infrastructure of the services necessary to begin transforming a city into a smart city, particularly in the telecommunications sphere. Because of the severe damage caused by the war in all sectors of generation, transmission, conversion, and consumption, the fuel required to operate the electrical system in the Syrian Arab Republic may be a major impediment (Belal & Shcherbina, 2018).

The international sanctions imposed on the Syrian Arab Republic have resulted in a significant handicap in terms of supplying modern technologies or developing them within the Syrian Arab Republic, in addition to the difficulty of supplying the raw materials, fuel, and equipment required to begin the process of development, and the poor economic situation that has hampered the return of many displaced people to their original areas.

Another important problem is the security and stability situation in which a portion of the Syrian Arab Republic remains outside the control of the Syrian state and is in chaos due to the large international intervention that wrongfully exploits the resources in those areas.

Furthermore, there is a lack of sufficient funds to finance research plans and studies in the field of smart cities, as well as their gradual application to the population, as well as a lack of legislation and laws required to develop key principles on the map of the transformation towards smart cities.

Azerbaijan's experience is useful in considering the best scenario for implementing the "Smart City" concept. International experience in smart city development includes three ones: centralized, non-centralized, and local activity variants (Huseynova et al., 2022).

According to the centralized scenario, the state represents local or regional government and is the primary organizer of all processes. Separate corporative technological projects are prepared and implemented in the case of a non-centralized scenario. Finally, a local activity scenario was implemented - a local joint activity on the application of smart city technologies by local self-management authorities and other interested parties. In the condition of Azerbaijan, it would be more prudent to use approaches that are a combination of the second and third activity scenarios, because these variants allow for the phased development of smart cities based on the presence of necessary opportunities for the attraction of financial and material resources, private and public funds in the territory. Given the decentralization reform and the difference in territorial-administrative units, I think this experience can also be used in Ukraine.

The war between Azerbaijan and Armenia has heightened the urgency of restoring the liberated cities and villages. As a result, the Smart City/Smart Village concept is a top priority for developing the Karabakh region in a sustainable manner. There is an urgent need to modify the existing quo and build a plan that would enhance all cities in a cost-effective and efficient manner while simultaneously speeding up the economic situation. The government recognizes the significance of Smart Cities, and Azerbaijan's president has even announced the development of Smart Cities/Villages in Karabakh. Following the war, the region requires focus in terms of economic, social, and environmental development (Valiyev, 2021).

III. THEORETICAL PART

One of the models that will help answer key questions related to a smart city change in times of war, achieving a balance between security and resource-saving, as well as helping IDPs meet their needs and solve their problems, is *Collaborative governance.*

Collaborative governance is a practice and subject of research that is still in its early stages; there are a number of more exact definitions that are debated and overlap in academic discussion. In the broadest sense, collaborative governance is a process that brings together state and non-state players to address a problem, whether they be public or private organizations, or individual people (Donahue, 2004).

Ansell and Gash (2008) offer six criteria for recognizing collaborative governance that may be used to differentiate it from other approaches:

- the forum is a formal procedure and is arranged officially;
- participants are not just to be consulted; they also have decision-making power;
- the process is launched by a governmental agency or institution and includes non-state players.
- decisions are made by consensus.
- the emphasis is on public policy or public administration.

Emerson and Nabatchi (2015) defined collaborative governance as the procedures and structures of public policy decision-making and administration that bring individuals together across public agencies, levels of government, and/or the public, private, and civic spheres to achieve a public goal that would otherwise be impossible to achieve.

The integrative framework defines collaborative governance broadly as the procedures and institutions of public policy decision-making and administration that bring individuals together across public agencies, levels of government, and/or the public, private, and civic spheres to achieve a public goal that would otherwise be impossible to achieve (Emerson & Nabatchi, 2015).

The engagement of several stakeholders in smart-city implementation in different places reveals that this idea necessitates coordination between local governments and diverse groups serving as public service providers.

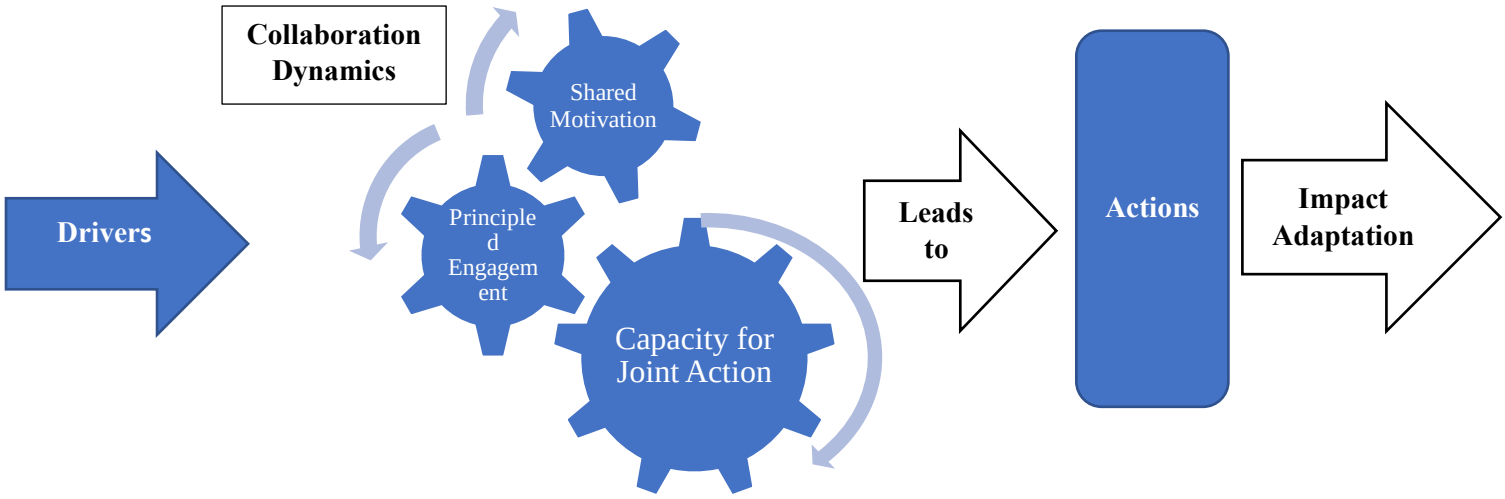

Figure 3.1 Collaborative Governance Regime

Source: Emerson et al. (2012)

Figure 3.1 depicts the integrative framework for collaborative governance as a series of interconnected and nested dimensions representing the surrounding system context, the CGR, and collaboration dynamics and actions. The ***outermost box*** reflects the various political, legal, economic, environmental, and other forces that impact and are influenced by the CGR. This system environment generates possibilities and restrictions that impact cooperation dynamics and process performance both initially and over time. ***Several factors*** develop from this system setting (e.g., uncertainty under the war) that produce the energy and push to begin collaboration and establish the early course for the CGR.

CGR is represented by the center box with dashed lines. The CGR can assume many different shapes and purposes, and it can have many different participants. The CGR includes both the repetitive cycling of collaboration dynamics and the collaborative activities that result from those dynamics. The CGR's collaborative dynamics, depicted by the innermost box with dotted lines, comprise three interactive components, each with its own features.

First, ***Principled engagement***, or the fundamental process component of collaborative dynamics, includes discovery, definition, discussion, and decisions. During principled engagement, CGR members establish a common theory of change, essentially a plan for achieving the CGR's collective purpose and target goals (Fig. 3.2).

Second, trust, mutual understanding, internal legitimacy, and shared commitment comprise ***Shared motivation*** or the relational component of collaborative dynamics.

Finally, the functional component of collaborative dynamics is the ***Capacity for cooperative action***, which includes procedural and institutional frameworks, leadership, expertise, and resources. Each component's constituents collaborate to develop and sustain that component, and the components collaborate interactively and iteratively to reinforce one another and accelerate collaborative behaviors. As previously stated, when academics examine changes in capabilities, communications, conflict management, trust, and other characteristics of social capital, the proximal effects of cooperation dynamics have been a main focus of CGR process performance.

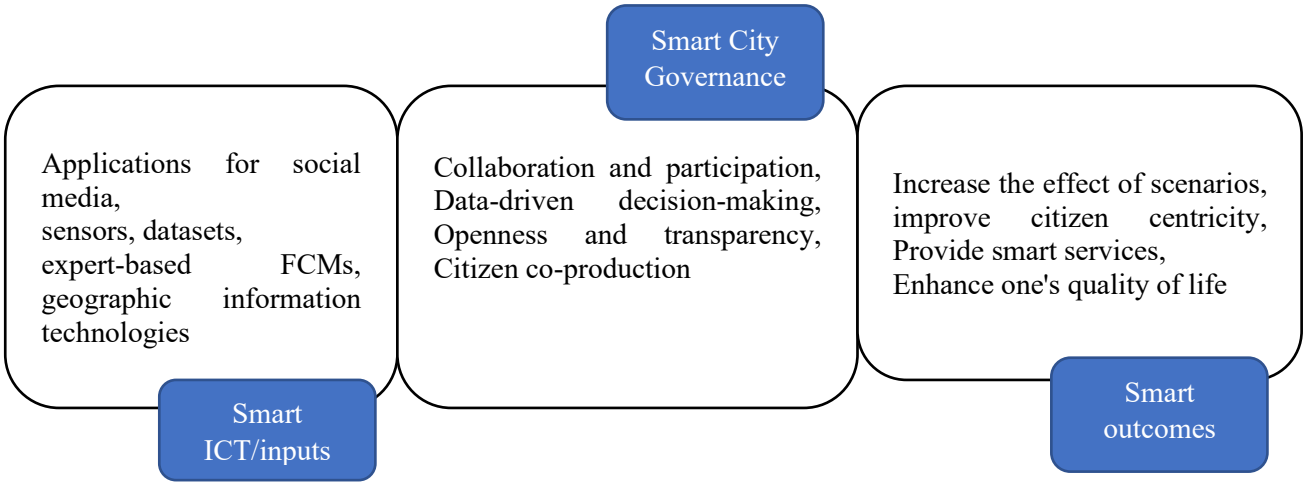

Figure 3.2 Smart City Governance

CGR performance productivity may be characterized at many levels of collaborative activities, as well as the results created by the actions and the subsequent adaptation to the outcomes. The integrative framework's production chain of actions/outputs, outcomes, and adaptability is typically congruent with a logic model approach to analyzing performance results. Collaborative activities, for example, or the efforts taken to achieve the CGR's shared objective, are direct outcomes of cooperation dynamics.

This study will also look at the growth of the smart-city concept in Kyiv, which will likely involve various stakeholders with varying requirements and responsibilities in its implementation. Because of the necessity to assist the inhabitants of a smart city through the engagement of various stakeholders (state, local government, and private industry), collaborative governance was chosen.

Thus, the framework depicts the government's evolutionary process of adopting necessary *electronic* and *smart government* capabilities and models, followed by the development of effective smart governance settings and the collaborative environment that characterizes them. This smart *government* approach may be applied locally to develop and implement smart city plans, initiatives, and solutions (Pereira, 2018).

Smart governance, the intelligent use of ICT to improve decision-making through greater cooperation among many stakeholders, including government and citizens, can be significantly tied to government

practices. In this situation, ICT-based technologies like social media and openness may boost public involvement and help to establish new governance models for smart government. Smart governance may also play a significant part in smart city programs that need complex interactions among governments, people, and other stakeholders (Fig.3.3).

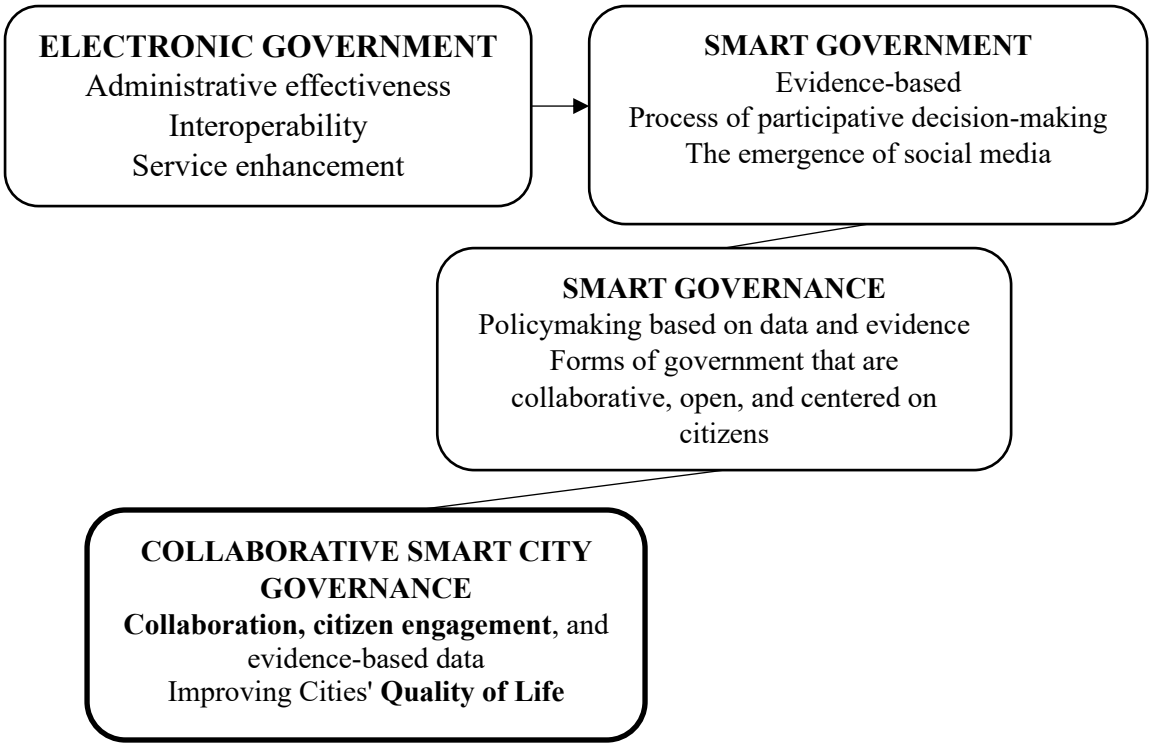

Figure 3.3 Collaborative Smart City Governance

Collaborative smart city governance empowers stakeholders (particularly people) to make decisions and engage in effective and efficient decision-making processes to improve the quality of life in smart cities.

To better understand notions of smartness in KSC before and during the war, I put the main elements (Smart People, Smart Collaboration, Smart Governance, Smart Technology, and main goals) in 2 groups – before and during the war. I will rely on them in my empirical research (section VI).

Figure 3.4 The notions of smartness in KSC before and during the war

IV. METHODOLOGY

This chapter examines the study design, the methods utilized to acquire and interpret the data, and the philosophy and ethics of the inquiry process.

The research methodologies lay the groundwork for the research. According to Neil McInroy, CEO of the Centre for Local Economic Strategies, failing to use adequate research methodologies and design produces a "shaky foundation for any review, evaluation, or future strategy" (Macdonald et al., 2008). The data you will obtain in any type of research can be in numbers or descriptions, which implies you will be required to count or chat with people (Macdonald et al., 2008).

In research, methodology is described as the systematic way of resolving a research topic by acquiring data using various methodologies, offering an interpretation, and drawing conclusions about the study data. A research technique is essentially the plan for a research or study (Murthy & Bhojanna, 2009). The methodology of my research project is shown below (Figure 3.1).

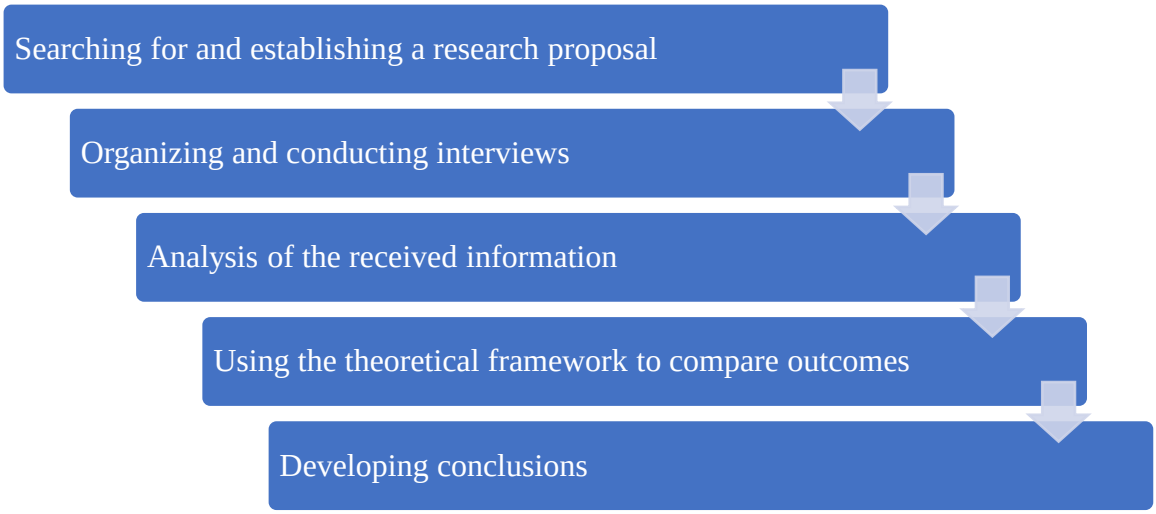

Figure 4.1 Process of my research project

4.1 Research design

Trochim (2005) states that research design "provides the glue that holds the research project together." A design is used to frame the research and demonstrate how all of the primary components of the research project work together to meet the central research issues" (Trochim, 2005).

The planned creation of settings for analysis and data gathering with the goal of combining relevance to the study objective with procedural economy is characterised as design (Selltiz, 1981).

A proper design ensures the success of the research. Successful research investigations produce reliable and unbiased information. There are four distinguishing features:

Figure 4.2 Distinguishing features of my research project

Source: built on the author's ideas.

Neutrality means that the research findings should be free of bias and unbiased. The researcher must understand many people's perspectives on the final evaluated scores and conclusions, and examine those who agree with the results. *Reliability* implies that to ensure the quality of your results, your plan should outline how to formulate research questions. *Validity* means that although various measurement tools are available, the only correct measurement tools help the researcher evaluate results based on the purpose of the study and the formulated key questions. A *generalised* approach suggests that your survey can be conducted with the same accuracy on any segment of a population *(Bhat, 2023).*

The study design entails considering the appropriate technique of data collection to give a relevant and accurate test of your thesis, one that can show causality if necessary.

There are two fundamental research methods utilized for either approach in the study: quantitative and qualitative research methodologies (Bouchrika, 2023). First, the researcher must choose between these or a combination of both approaches. The qualitative research framework is designed to provide a comprehensive and extensive explanation of your observations as a researcher (Macdonald et al., 2008). It includes such methods as in-person focus groups, in-person in-depth interviews (IDIs), Telephone IDIs, Discussions using online communities, and Mobile (Bouchrika, 2023).

Researchers can ask many types of questions, resulting in various forms of data. Closed questions, for example, offer people a predetermined set of responses, whereas open questions allow people to express themselves on their own terms. Because I wanted to acquire the respondents' complete perspective on the current situation, I used open-ended questions throughout my study. Furthermore, open-ended questions are more effective in situations of unpredictability and poor predictabilitye.

Interviews are frequently recorded by the researcher, and the data is put up as a transcript (a written summary of interview questions and replies) that can be analyzed later. I used this approach in the case of my first Interviewee.

The interview can take one of two forms: *Structured* indicates that the interviewer has a predetermined number of questions. *Semi-structured* means that the interviewer has a list of questions or a goal in

mind, but the interview might still go in unexpected directions (Emerald Publishing, 2023). For my investigation, I have chosen a *Semi-structured Interview*.

Unstructured interviews, also known as in-depth interviews, are typically described as conversations held with the goal of gathering data for a research study. These interviews have the fewest questions because they are more like a typical discussion with an underlying subject. The main goal of most researchers who use unstructured interviews is to form a bond with the respondents, which increases the likelihood that the respondents will be completely genuine with their replies. There are no rules that the researchers must observe. So, they can approach the participants ethically in order to gather as much information about their research issue as feasible (Bhat, 2023).

At the same time, interviews may not be the greatest method for researching some topics because people may feel more at ease filling out a questionnaire in private. In this case, the experts received e-mails from me and responded to them.

4.2 Data collection strategy

My qualitative research was carried out in the context of Ukraine. The information was gathered through five in-depth interviews framed around open-ended questions. During the interviews, I attempted to examine the growth of smart cities in Ukraine and the effects of the war. This method aided in completely comprehending how the war has influenced the Kyiv smart city initiative.

However, due to the fact that the information was collected during wartime in Ukraine, it is impossible to receive data from 2023, so the period from 2019 to 2022 is considered the active period of smart city development in Ukraine and can be called the investigation period of this research.

Respondents received my communication before the meeting, which I added to Appendix II. In the case of a positive response, the respondent completed a survey, which revealed which questions the respondent wanted to discuss further during the interview, and we determined the format of the meeting that was most convenient for the respondent. Appendix I contains this information.

Before beginning the interview, I outlined the goal of my research, the basic principles, and the aspects of a smart city I was interested in learning about. Following that, we discussed the interview questions (see Appendix III), which were augmented and improvised throughout the talk based on the speaker's responses, background, etc. Initially, interview questions covered a wide variety of characteristics of a smart city in order to find fascinating details from many perspectives. The inquiries then focused on specific areas where the speaker had more professional expertise and

personal interests. It is a form of semi-structured interview in which the main goal is to stimulate the responder to express himself/herself on the selected topic rather than to steer the response.

Respondents were specialists who work in their professional activities or are involved in the practice of smart city development. Respondents included developers of the Kyiv smart city project, members of the Verkhovna Rada, the Ministry of Finance, research institutions, and non-governmental organizations.

The group of interviews closely covered the whole range of stakeholders identified in the literature research. I attempted to choose responses from various institutions that view smart city development from various perspectives, which allowed me to see the big picture and construct an independent vision of smart city development in Ukraine. In other words, each of the chosen responders (stakeholders in smart city development) can articulate his/her own vision for smart city development.

4.3 Data analysis

After conducting a sufficient number of interviews, the results had to be processed and analyzed. During expert interviews and research, it was discovered that the war affected the development of the smart city. Thus, the first question of my master thesis is as follows: How is the smart city of Kyiv project influenced by war?

And what needs to be done in order to ensure security (first of all, people's lives) and at the same time save resources (energy saving, saving financial resources, etc.). This is challenging, but possible by doing a detailed analysis of Ukrainian practice and world experience of the smart cities' creation. So, it will be my *second key question*. Based on mentioned ideas, Collaborative Governance was chosen as a tool for analyze in this master thesis. A deep explanation of mentioned tool for analyzing and conceptual framework could be found in section III.

Nowadays, more research suggests focusing specifically on smart city development approaches, while in times of war, smart cities can have a positive impact on solving the problems of citizens, especially those who need help the most. So, the *third question* I want to study is how can smart city development help IDPs meet their needs and solve their problems.

The criteria for including information from the interviews in this study was any information that describes the process highlighted in the theory of the *Collaborative Governance*. As a result, any logical models that were not anticipated or included in the Collaborative Governance framework for smart city development shown in Figure 3.3 were excluded.

During the analysis of all information during the research, *general scientific* and *special methods* were used, such as *systematic approach, comparison method,* and *structural functionalism*.

Structural functionalism was chosen because it allows us to view the research object (a smart city) as a complex system whose pieces work together to foster security and resource-saving.

System approach considers a smart city as an open system, consisting of several interconnected subsystems; as a multifaceted phenomenon that unites the goals, resources and processes occurring within a smart city and around it.

The *grouping method* and the *tabular metho*d were used to characterize various types of tools for the development of a smart city. In other words, in this study, after deciding on a specific research framework, various facts were gathered in order to reach more general conclusions and assumptions.

In addition to the primary data from the interview, I researched legislation, publications, working papers, textbooks, and open analytical sources on smart cities to supplement the evidence from the interviews. Secondary sources of information were employed to prepare for the interview and verify the information's accuracy thereafter.

The Nord University electronic databases and public access were searched for scientific papers for analysis. The literature was chosen based on estimating the publisher's ranking, relevance by years, and so on. Data immediately relevant to this study were assessed and published as a paraphrase, quote, table, or figure with the authors' names.

Furthermore, this master thesis shows some practical cases that cannot be proven by open Internet sources, and they rely solely on respondents' practical experience, honesty, and openness to interview issues. In providing such examples, it was indicated that this information is based on the expert's personal experience and had not before been released by public sources. That is why, in my work, I do not identify the specific names of government organizations where a particular smart city development practice has occurred. I simply indicate the breadth of operations critical for assessing the obtained data.

4.4 Research Philosophy and Ethics

Scientific research philosophy is a system of thought the researcher develops that results in fresh, verifiable knowledge about the study object. In other words, it is the foundation of the research, which includes the selection of a research strategy, problem formulation, data collecting, processing, and analysis.

Research philosophy is an essential component of research technique. Ontology, epistemology, and axiology are the three branches of research philosophy. These philosophical perspectives enable them

to decide which strategy the researcher should take and why, based on research issues (Saunders, Lewis, & Thornhill, 2009) (Table 1).

Table 4.1. Three components of the scientific research paradigm

Components of research paradigm	Description
Epistemology	The general characteristics and assumptions are connected with a good technique to investigate real-world nature.
Ontology	General assumptions are developed in order to perceive the true nature of society (in order to comprehend the true nature of society).
Methodology	Combination of many methodologies used by scientists to investigate various circumstances.

Source: Easterby-Smith et al.

According to Dougherty and Slevc (2019), identifying one's research philosophy is critical when participating in scientific research since it clearly articulates the study's goals and expected outcomes, as well as the viewpoints for its evaluation.

Every study has a philosophy and a strategy or ways of studying a topic. Now that you understand what methodology in research is, the following step is to identify the various research methodologies. Traditionally, researchers approach research projects using the technique that research institutions use, which is divided into two paradigms: positivistic and phenomenological (Collis & Hussey, 2013). *Positivism* is the philosophical notion that all information must be validated scientifically by tests, observations, and logical/mathematical proof. *Phenomenology* is a philosophical discipline that seeks to comprehend people's subjective, experiences and views.

In turn, the main paradigms are as follows: Constructivism, Interpretivism, Symbolic interpretivism, Pragmatism, and Positivism.

Among different paradigms, I choose Pragmatism. It entails research designs that contain operational judgments based on 'what will work best' in finding answers to research questions, allowing pragmatic researchers to conduct research in novel and dynamic ways to find solutions to research challenges.

While positivist and interpretivist approaches are mutually exclusive, pragmatism proposes that there are many different ways to conduct research to investigate reality and that combining different approaches may provide a broader understanding of the phenomena under investigation.

V. RESEARCH CONTEXT

5.1 What is Kyiv Smart City?

As for the experience of Ukrainian cities, the only city that took the path of competition for positions in the global smart ranking was Kyiv. In 2021, Kyiv has risen by 16 points in the global Smart City Index ranking and ranked 82nd globally.

Also, within the Kyiv Smart City Forum 2020 framework, smart city technology experts identified Ukraine's 12 most technologically advanced and innovative cities. The selection criteria included the following:

– how local authorities implement original and innovative solutions in the digitalization and development of the city infrastructure;
– whether systems and networks improve as a result of such work;
– to what extent digital technologies are implemented and how cost-effective these projects are,
– whether they also have a positive impact on the lives of residents.

In 2022 Kyiv was presented at the Smart City Expo, where the capital of Ukraine got one of the nominations for the prestigious Smart City Awards. As stated on the website, “At the resistance of the Russian aggression, the Kyiv government demonstrates how digital technologies help the places to become stable. Servicing on public security, and mobility systems and working on transferring all services for local residents to online mode” (Kievvlast, 2022).

At the same time, problem areas are subject to further study. But first, it is advisable to consider and study the research context of SmartCity.UA.

The structure of SmartCity.UA also includes the Kyiv Smart City initiative and the Smart City Hub community service center, created several years earlier. The main mission of the SmartCity.UA initiative is to transform the cities of Ukraine into a safe environment for a comfortable life for citizens. The goal of Smart City.UA is to promote comfort and safety in the cities of Ukraine, speed up the provision of services by government agencies, and remove corruption by digitalizing city services.

SmartCity.UA brings together cities and communities of Ukraine, state authorities, investors, business community, associations, and activists for the development of smart city in the regions of Ukraine.

SmartCity.UA specialists work out and build a common architecture and a system of interconnections between national and regional digital solutions in advance. SmartCity.UA's activities are based on ensuring the successful reproduction of innovative technologies in promising regional smart city projects. The initiative creates an open model of relations between society and local authorities.

They carefully study and share the world's best practices to research the best methods and models for implementing smart city solutions and tools. The SmartCity.UA initiative brings together data collected from established, current, and future smart city projects and develops and makes recommendations to enable further dissemination of best practices.

The initiative provides guidance to local and national governments and decision-makers on the legislative changes and support needed to develop regional digital initiatives.

SmartCity.UA implements successful innovative smart city technologies in all cities and regions of Ukraine, and adapts, develops, and maintains appropriate customized solutions.
In general, the Ukrainian public is beginning to make ever higher demands on the quality of state nature, its improvement, and safety. All participants benefit from SmartCity.UA (Fig.5.1).

QUALITY AND CONVENIENCE	Ukrainian societies are not yet able to fully respond to the existing demand for improving the quality and convenience of the urban environment. As a result, there is a migration of residents of small and medium-sized towns to regional centers and the capital. In the context of the development of digital technologies, not only ordinary citizens, but also local businesses are making new demands on the convenience of city services and services, the functioning and development of local infrastructure, and the security of doing business.
SMART APPROACH	"Smart City" is one of the most attractive tools for local authorities seeking to improve the quality of life of citizens and the effectiveness of public administration. In order to solve the "chronic" problems of cities and communities and quickly respond to the complex needs of societies, local governments need to modernize and digitalize many areas of urban life. The smart city approach allows city authorities to make more informed decisions that will make the lives of citizens more comfortable and safer.
DEVELOPMENT STRATEGY	The smart city strategy is attracting regional leaders with the opportunity to create more flexible, efficient, democratic and inclusive local governance that fully reflects local needs. Striving for economic growth, improved governance, improved environmental health and a more positive image of the city and city authorities, Ukrainian mayors are becoming the founders of a smart city. The commitment of regional leaders to the smart city strategy also coincides with the search for new political and economic roles for communities in the national and international context, for example in promoting the image of the region, attracting investments, inviting more qualified specialists, managing resources, etc.

Figure 5.1 Benefits of SmartCity.UA for participants

Source: Smartcity.ua (n.d.).

5.2 Main technological applications

Citizens can experience all the benefits of a smart city with the help of electronic services (Resident's web office, Mobile APP and Municipal card). In addition, applications work in other important areas: education, transport, medicine, housing and communal services and electronic democracy (Fig.5.2, 5.3).

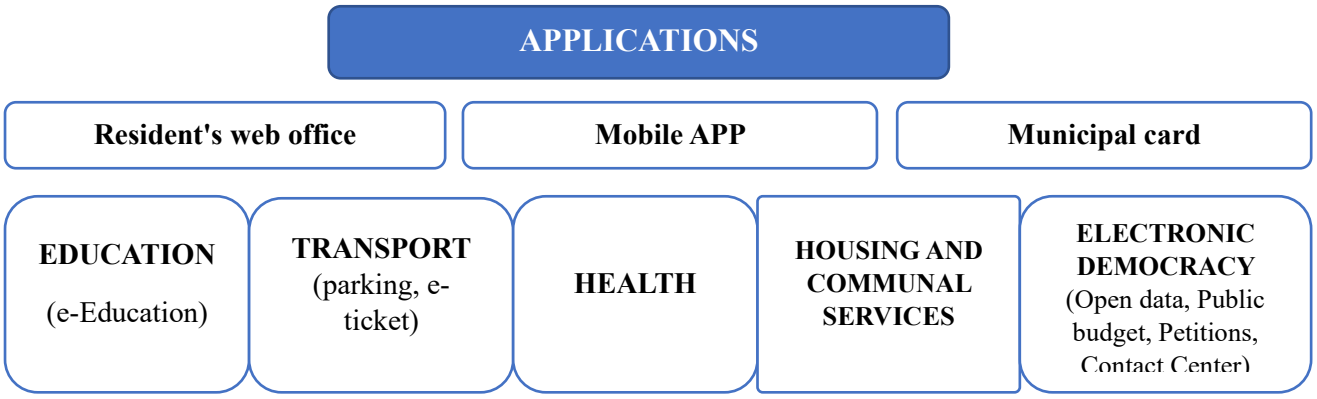

Figure 5.2. Applications of SmartCity.UA

Source: Smartcity.ua (n.d.).

In addition, there are platforms of SmartCity.UA: Register of residents, Property Accounting, Smart City platform core, and Accounting.

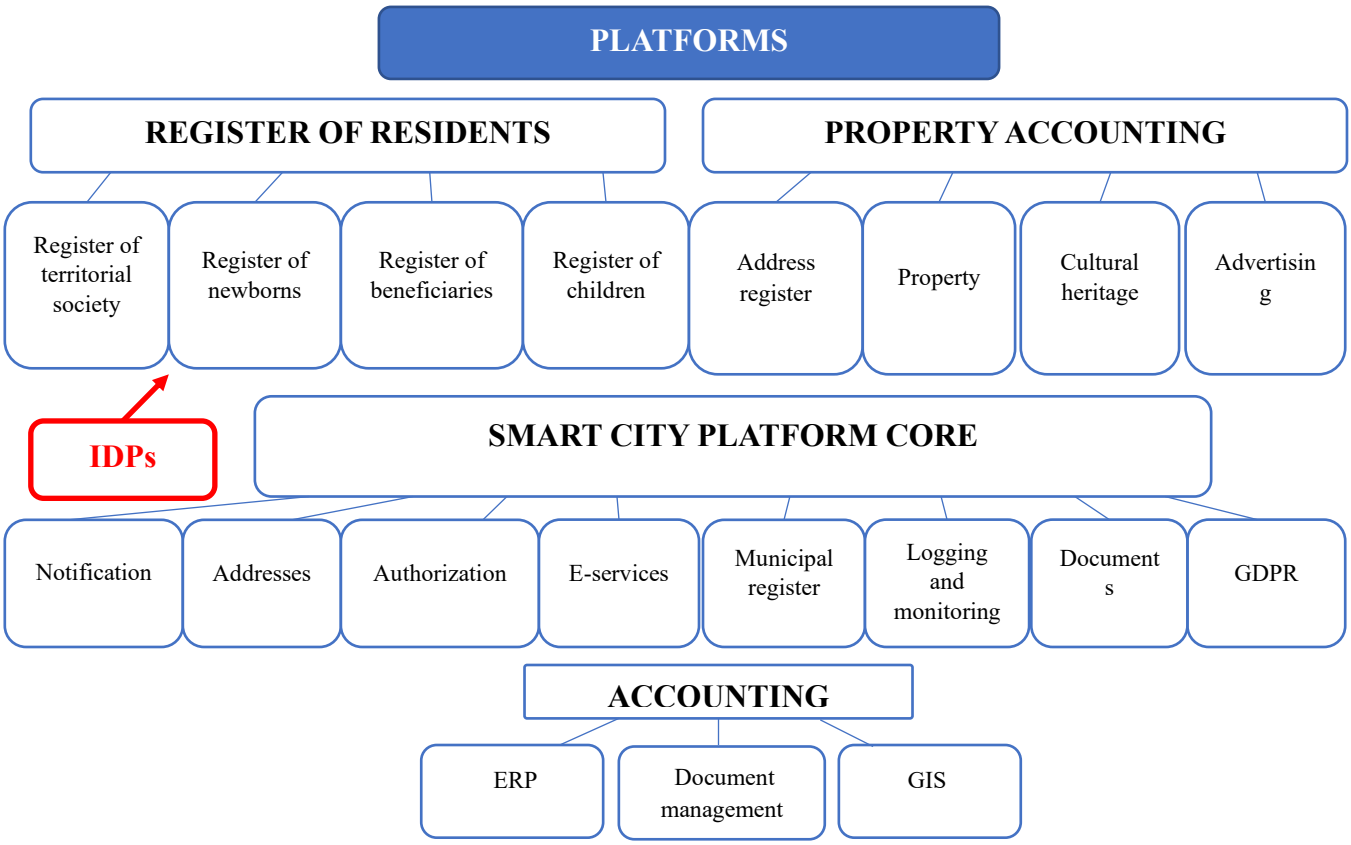

Figure 5.3. Platforms of SmartCity.UA

Source: Smartcity.ua (n.d.).

5.3 Impact of the War on smart city development

In the conditions of the war, when the question of survival became, when the enemy was near the capital, the people of Kyiv had to protect themselves and their loved ones, find where to buy the necessary products and medicines, and have information about what services are available.

The Kyiv Digital app came in handy in the most difficult times for the capital's residents as a digital assistant, as one of the resistance tools. The experience of transforming smart city technologies during the pandemic allowed the city authorities to quickly adapt the application (which works on the principle of "a city in your pocket") to the needs of the people of Kyiv under martial law.

Since 24 February 2022, KCSA focused on priority areas that came to the fore in the new realities of life. The first was communicating effectively with the city's residents about the current situation. Useful information to help the people of Kyiv how to organize and secure their lives in the new conditions. Kyiv Digital added the ability for residents to report information about hostile and suspicious objects. In this way, people helped defend their city.

Thus, starting from February 24, 2022, with the help of a smart application, the capital is facing the following challenges:

- residents of the capital received an air raid alert 680 times;
- "Kyiv Rescue Service" made 48 trips to eliminate the consequences of rocket attacks in the capital;
- Ambulance teams made 929 trips to the sites of missile attacks and attacks by drones, and assisted 713 patients;
- more than 8 thousand Kyivans in the first months of the war received daily assistance from the Humanitarian Headquarters of Kyiv;
- the humanitarian headquarters of Kyiv attracted assistance from 130 international partners;
- the metro, as a shelter, simultaneously accepted up to 66,940 Kyivans;
- more than 200 bomb shelters connected to Wi-Fi, 19 providers have joined the project. This allowed the students to participate in their studies and their parents, if they are working remotely, to do their work while in the vault.

If during the war the smart network of Kyiv was focused on a technocentric approach, that is, the provision of modern high-tech services that meet European standards, then with the outbreak of the war, the safety of citizens came first. Therefore, a human-centered approach has become a priority.

So, the Kyiv City State Administration reports that since the beginning of the war, the city authorities have evacuated more than 6 thousand people from socially unprotected categories of the population from Kyiv to the western border of Ukraine. Since the beginning of the war, more than 229,000 IDPs have been registered in Kyiv, including 40,000 children.

Unfortunately, more than 700 buildings were damaged as a result. In particular, 417 multi-story and 109 private houses, and 93 educational institutions. At the same time, the relevant infrastructure has always worked in Kyiv: utilities and transport services, rescuers, and doctors. It is also important to

note assistance to businesses: in a limited mode, but still, grocery stores, pharmacies, banks, gas stations, car services, pet stores, and other establishments were open (Kyivcity, 2023).

Power stations were damaged due to rocket attacks. Therefore, the city faced a challenge: how to save available resources and find alternative options.

The first "Points of indestructibility" were launched in Kyiv in 2022. According to the KCSA, each such point was able to simultaneously receive from 40 to 500 people, regardless of the time of their stay. These people could charge their mobile devices, keep warm, use mobile communications, the Internet, and even first aid. In addition, such tents were equipped with "mother and child" rooms.

The role of "Points of indestructibility" in addition to specially equipped tents of the State Emergency Service, is performed by specially equipped places in government buildings, kindergartens and schools, and other public places. All of them are indicated on a special interactive map on the project website nezlamnist.gov.ua.

5.4 Situations with IDPs under the war

The Register of Residents should contain IDPs. Let's consider the current situation with IDPs in Kyiv:

1. Every 8th unemployed registered in Kyiv is an IDP

- 1 761 unemployed people with the status of IDPs were registered in the Kyiv employment service. In total, they accounted for 12% of the total number of unemployed.
- The employment center added that Kyiv is one of the three regions with the largest number of IDPs who received services of the Service in 2022.
- In particular, since the beginning of 2022, 3.5 thousand IDPs have acquired the status of unemployed in the city employment center.

2. More than 100 000 IDPs have registered in Kyiv since February 24.
3. Support for IDPs includes the following:

- People will receive support in the amount of UAH 3 000 for each child or person with a disability and UAH 2 000 for each other person.
- IDPs can receive free consultations on various issues (in particular, about employment, legal and psychological assistance).
- And for the shelter of IDPs in Kyiv, people can get compensation.

4. Support programs for the *employment of IDPs*:

- *Compensation for employment of IDPs.* In the spring of 2022, a mechanism was launched to compensate employers for the employment of IDPs. This program is aimed at employers who, during martial law, employ IDPs with a salary not lower than the minimum wage. Compensation for expenses is provided in the amount of UAH 6 500 per month for each employed person (within two months).
- *Grant Support.* Another effective mechanism for creating jobs is the provision of Grants for developing entrepreneurship to Small and Medium-sized businesses. As practice has shown, small and medium-sized businesses showed greater flexibility and viability during the war. These enterprises were the first to be able to relocate to safe regions and resume production there. And now they are ready to create new jobs with the help of the state.

In the summer of 2022, Ukraine launched 6 grant programs under the single name "eWork". They are aimed at different categories of entrepreneurs, and later programs will be launched for unemployed Ukrainians and IDPs who want to master a specialty of IT. The main idea of this mechanism is simple and clear - the state helps to start or expand a business, and entrepreneurs create new jobs.

In order for IDPs to be included in both the smart city concept and the smart city project, it is necessary to study their needs and analyze how a smart city can help them. Thus, my next step is to interview the responsible persons involved in this process and others who can give a critical view of this situation.

5.5 Influence of Stakeholders on the smart city management

Because project stakeholders influence project management processes, it is critical to recognize them in order to create and execute a sufficiently rigorous stakeholder management approach (Olander, 2007). Stakeholder management has been regarded as a critical activity for project success (Eskerod and Huemann, 2013). Stakeholder identification, classification, communication, engagement, empowerment, and risk management are all aspects of project stakeholder management (Rajablu et al., 2014). Stakeholder management is a concept developed from the resource-dependence viewpoint, and it covers risks and ethical issues as a primary focus of project stakeholder management (Gemünden, 2016).

In the quest to become a smart city, problems connected with various varied stakeholders, high levels of interconnectivity, opposing values, and social and political complexity may arise (Nam and Pardo, 2011). The transformation of a non-smart city to a smart city necessitates the interaction of political and institutional components with technology as the smart city innovation, highlighting the need of stakeholder management in a smart city project (Mayangsari and Novani, 2015). Furthermore, the

author recognizes the involvement of stakeholders at each step of sustainable smart city development. Stakeholder management is critical in launching smart cities with the goal of creating a sustainable and liveable city. It is critical to include stakeholders and ensure that their actions align with the goals of the smart city project (Angelidou, 2014).

From one region to the next, smart-city stakeholders are numerous and diverse: politics, industry, startups, people, and architects. They are all parts of the forces that shape cities. Let us first sketch an overview of those actors' roles and needs, and then consider what this means for the shape of our society (Table 5.1).

Table 5.1. Smart city stakeholders in the Context of Kyiv smart city development

Stakeholders	Roles	Needs
Government and Public Sector	Experiments on a large scale, business opportunities, and large financing capabilities.	To identify ways to increase efficiency and cut expenses while maintaining a high standard of living for its residents.
Financial and Founding Partners	They assist businesses and governments by sponsoring and investing in projects; protect the interests of small and large depositors by selecting profitable ventures to invest in.	Companies of all sizes, investment platforms, and strong government links.
Big companies (Real Estate)	Both in the IT and construction areas, they maintain infrastructure and technology platforms and host startups and SMEs.	It is critical that urban design include social demands such as common use, social cohesiveness, and the possibility of self-realization and individual freedom.
Startups, Micro-Small -and Medium Sized Enterprises	They experiment with new ideas and start new enterprises.	They must avoid bureaucracy and seek their first real business chance.
NGO and Associations	They have an impact not just on corporate behavior by influencing social acceptance, but also on politics and society in general.	Social innovators in a smart city must strive to promote new types of civic involvement capable of efficiently meeting social needs with updated capabilities.
Civil Society	Good level of expertise on their own demands based on daily life experiences.	Addressing the issue of social exclusion, which is always related to the district's physical and functional marginalization, pervasive poverty, a lack of services, and unemployment.
IDPs	Evaluation of statistics on the flow of IDPs, and defining their needs by social and sociological services can serve as a source for determining directions for the development of the smart city concept	The need for housing, employment, placement of children in kindergartens and schools, restoration of damaged/destroyed documents
Innovation tourists	They visit sites and cities that are known for their inventiveness; represent and seek new networks and contracts.	They are looking for benchmarks and want to study and expand their business.

R&I, Academics, Universities	They play an important role in the process of developing new solutions that can lead to a healthier and more sustainable urban existence.	Providing possibilities for the acquisition of information, knowledge, and experiences.

Source: builds on author's ideas, based on Carbonnell (2019)

There is no single stakeholder who is more important than the others, but they are all identified as necessary components for success.

Moreover, even if all stakeholders are not equally important in decision-making, none of the actors will be able to accomplish smart or sustainable cities without the support of the other stakeholder groups.

VI. EMPIRICAL FINDINGS

Since Ukraine is facing for the first time a full-scale war, which led to the death of a considerable part of the population, and caused enormous damage to people's lives, leaving many without means of subsistence, the experience of other countries is beneficial. But equally important is developing a strategy — Kyiv's development strategy until 2035.

> *The main directions of this strategy are public security, social active inclusion, public partnership, open data, and carbon offset. And thanks to them, Kyiv can enter the TOP-30 smart city cities in the world (Interviewee 5).*

I explored different smart city concepts in my literature review and came to the conclusion that under the war the core concepts of urban design are centered on security, energy efficiency, and pollution removal. The results of the interview provided an opportunity to take a deeper and further look at the solution to this problem:

> *The concept should be based on the DIKW pyramid, which is a popular concept with origins in knowledge management that describes how we go from data (D) to information (I), knowledge (K), and wisdom (W), with a component of actions and decisions (Interviewee 5).*

The needs of people in the conditions of war have changed, and, accordingly, the priority of projects that are being implemented in the smart city. One example is the draft law On Amendments to Certain Legislative Acts of Ukraine regarding Ensuring Civil Protection Requirements in the Planning and Development of Territories (No. 7398). According to the law, design solutions must ensure compliance with accessibility requirements for persons with disabilities and other groups with limited mobility.

> *In times of war, the emphasis is on security and sustainability, that is, the constant performance of the system (Interviewee 1).*

> *In times of war, attention is paid to the following areas: security, transport, energy saving, medicine and education, and local services (Interviewee 5).*

On the one hand, I considered the needs of citizens, ways to ensure citizens' security, and the possibility of using resource-saving technologies (options) in the face of a lack of urban resources in war conditions. For my research, I used *Collaborative Governance* (Figure 3.2).

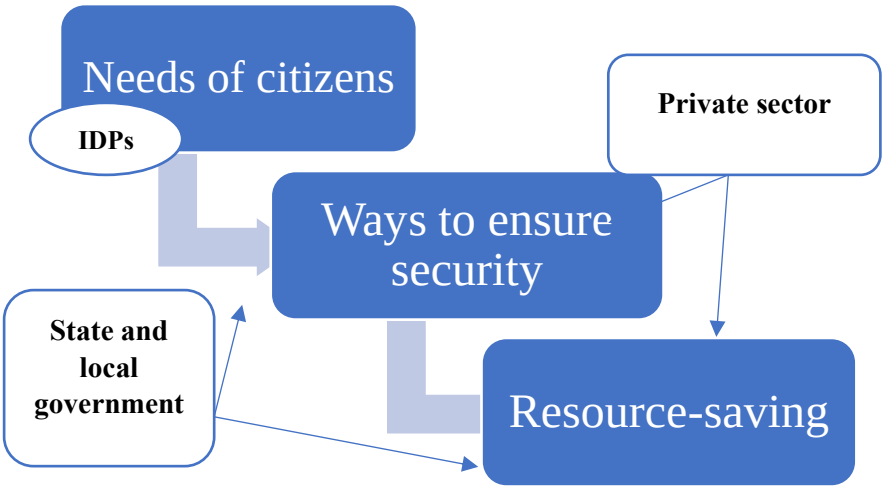

Fig. 6.1 Stages of conducting Empirical findings

After that, I will study the need for smart city's support of different categories of citizens facing the war and opportunities to adapt foreign experience in supporting IDPs in subsections 6.2 and 6.3.

For most countries of the world, military content forms a powerful part of this economy, which promotes services and goods, and changes the behavior of consumers of services (Andriienko, 2023).

> *The number of projects has dropped dramatically because cities have redirected funds to other important needs (urban regeneration, IDPs, etc.). But the direction of security began to develop more seriously (video surveillance systems, warnings (loudspeakers and mobile applications), geographic information services (map of bomb shelters, WI-FI points) (Interviewee 1).*

Therefore, it is not so important to increase or decrease the number of projects in war conditions, but the quality and timeliness of the provision of services to ensure the safety of citizens are crucial.

> *The development of initiatives related to the remote provision of services has significantly accelerated and expanded, including providing assistance to temporarily displaced persons and other citizens who could not use the services physically (in person). For example, the use of the Kyiv Digital application has proven itself quite well in terms of alerting citizens to danger and as a navigator in the urban space, which significantly gave residents confidence (a sense of security) and speed in meeting their needs: places of help, purchase of necessary products, etc. (Interviewee 2).*

6.1 Measures to balance between ensuring security and resource-saving in smart city development

The top technologies that turn the city into a "smart city" are as follows:

1. Internet of Things,
2. Digital twin,
3. Geoinformation technologies,
4. "Smart" street cameras,
5. "Smart energy",
6. "Smart houses",
7. Environment for secure Internet data exchange between information systems.

First, **is *the Internet of Things*** (Andriienko & Mamatova, 2021). A wide range of devices includes sensors, software, and other technologies for connecting to and sharing data with other devices and systems through the Internet. A few examples of the world of the Internet ― sensors installed in houses that monitor the condition of these buildings. But unfortunately, there is a problem with their use in Ukraine:

> *Due to the fact that service providers do not always belong to the city, and therefore are not subordinate to it, it is challenging to implement Internet of Things projects (Interviewee 1).*

Secondly**,** the **Digital Twin** (the digital city is a twin). This is a digital copy or a physical object, that is, a repetition of an object or city services in digital form (Faine misto, 2021). Copying digitally allows you to effectively simulate the development of an urban area, the operation of housing and communal services, transport, security, and the impact on the city of climate and environmental conditions. Such a virtual model allows for managing all systems in accordance with the adopted city development strategy, predicting the consequences of the proposed changes. This is the tool for finding optimal urban planning solutions. Well-known examples of cities, to a large extent represented or displayed online: Singapore, Stockholm, Helsinki, and Boston.

For example, Stockholm uses its *OpenCities Planner* to stream information-rich area models for quick and easy information sharing. With the help of a simulator, a virtual twin can predict and visualize different scenarios for the behavior of many people at large city events. This makes it possible to better organize entrances and exits in areas with the greatest concentration of people, thereby increasing safety.

In Rwanda (Africa), *sensor-based data* is used. The sensor data can be used to decide measures to be performed, such as dealing with water pollutants, warning people about flooding dangers, decreasing pollution effects by reducing car traffic at specified hours, or informing urban planning decision-making. Such maps and sensor data can also assist local governments in planning for resilience,

determining the site of new developments and transport lines, and guaranteeing more diverse land use and optimal density. The data (taking into account safety regulations) can also be shared with individuals to assist them in making more educated decisions about where to live, work, and move in the city (Rich, 2017).

> *Creating a Digital Twin should primarily concern critical and transport infrastructure facilities. This is a great option for building a city layout and looking for ways to manage it optimally, especially in the face of danger caused by the war in Ukraine (Interviewee 5).*

The third component is **Geographic Information Systems** (Atamanova & Smyrnov, 2022). These are systems for collecting, storing, analyzing, and visually visualizing geographical data and related information about physical objects. The system may include a database of remote sensing of the Earth, spatial databases, editors for raster and vector graphics, and various tools for spatial data analysis. Such systems are used in cartography, geology, meteorology, land management, ecology, urban planning, transport, economics, defense, and many other fields.

> *The rapid introduction of computer and information technologies into the troops' activities, which has recently taken place during the Russian war in Ukraine, provides new opportunities for solving the problems of command and control. Automation of control processes, considering navigation information, can significantly reduce the time for coordination and coherence of troop actions in conditions of a sharp change in the situation, high dynamics of hostilities, and the use of high-precision weapons (Interviewee 1).*

The fourth component is "**Smart" street cameras** (Berdanova, 2017). These are means of order control, detection of street crimes, and maintenance of roads. By detecting potholes, broken roads, and inaccurate street markings, smart cameras can be considered street accuracy researchers. It will play an essential role in transforming the city into a smart city.

> *In a war, video surveillance is one of the most critical projects. We studied the experience of Tel Aviv, London, and Chinese cities, and thus the project of a video surveillance system was born. We have adopted this experience at the legislative and technical levels.*
>
> *At the moment, more than 7 thousand video surveillance cameras have been installed in Kyiv, the core of the video surveillance system, a data storage system have been created (the video archive is stored for more than a month), and such analytical functions have been introduced as recognition of numbers, faces, search for cars and people by a secondary attribute (color, brand). It was the first project in Ukraine and following the example of Kyiv about 50 cities*

implemented video surveillance (Interviewee 3).

The fifth component is **"Smart" energy.** This is the so-called smart energy chain, which is completely dependent on renewable energy sources such as solar energy and wind energy. This system transfers decentralized clean and sustainable energy to urban areas through a smart digital system.

> *Projects that improve the security of citizens and provide equipment for shelters are extremely important in war. Energy conservation measures are equally important due to damage to energy infrastructure facilities. Therefore, installing solar power plants on the roof of buildings will save electricity and conduct lessons even when the lights are turned off (Interviewee 3).*

The sixth component is **"Smart houses".** These buildings use automated procedures to create smart ones, including automatic lighting, process equipment, sensitive plumbing, access control system, digital signage, navigation, and security systems. High-tech buildings can reduce resource use, increase energy efficiency, simplify building maintenance, and reduce operating costs. One innovative example of smart buildings is The Edge in Amsterdam. According to Bloomberg, Edge is the smartest and greenest building in the world, with the highest green score ever awarded: 98.4%. About 28,000 sensors are installed inside, and each person inside the structure is connected via a mobile phone application. Smart devices give visitors instructions on where to go so that they are all in the right place at the right time (Briukhovetska, 2020).

The seventh component is the **Environment for secure Internet data exchange between information systems.**

> *Creation of local connectivity by building a private network, which will be safer and more economical, given the low cost of the Internet in Ukraine. Such a system will also provide convenience and efficiency in collecting data on critical and transport infrastructure and the number of people living in certain areas and their needs. In addition, this connectivity can be provided as a service. For example, in Australia, community units (pillars, stops, kiosks) can be rented out and the proceeds go to the city budget (Interviewee 5).*
>
> *In times of war, attention is paid to the infrastructure, which should ensure the continuous operation of all services, especially critical ones. If there is a system failure, the public will not be notified in time of the danger. Therefore, attention should be paid to the basic IT infrastructure, hot standby systems, data processing services, and cybersecurity (which threatens to block systems) (Interviewee 1).*

Budget funds are constrained in times of conflict. As a result, the initiatives now being undertaken require extra finance from the private sector. When attracting private capital, a portion of the budget can be used to implement strategically important smart city projects.

> *In general, there are several sources of financing for a smart city: the city budget, and investors' funds (it works for the "Electronic ticket" project, "Electronic parking"). And under such projects "investors come" — this is a public-private partnership. The third source of funding is donor funds (0.5-1% of the budget of all projects), which are provided for implementing projects for the development of democracy and education, and they are not provided for technologically complex things (Interviewee 1).*

> *In the first month of the war, which was the most difficult and uncertain, the SME helped the local government. Thus, some private carriers provided free travel for citizens on certain routes. We (KCSA), of course, offered free public transport, but for us, the help of the private sector was the real surprise. In addition, the five Internet deliveries also provided free shelter services, and people could receive notifications in time and contact their families (Interviewee 4).*

> *International technical assistance may be provided directly or indirectly through an agency (for example, USAID provides funds for cybersecurity). Thus, donors transfer funds to these agencies, and financial consulting companies are also involved. Another example is the Klitschko Foundation, which collects donations to social projects (Interviewee 5).*

However, the PPP tool is not without certain drawbacks. In particular, there are certain contradictions and underdevelopment of the legal framework.

> *There is no doubt that the PPP is one of the important and effective tools in regulating smart city development. But at the same time, unfortunately, there is no legislation regarding the regulation of PPP in Ukraine. There is only concession legislation (Interviewee 5).*

The management of the smart network is engaged in further developing the capital in the face of new challenges. Thus, Kyiv signed a Memorandum with the National Technical University of Ukraine "Igor Sikorsky Kyiv Polytechnic Institute" and the Sikorsky Challenge project on cooperation in implementing projects for the innovative development of the capital.

> *The purpose of the Memorandum is to unite the efforts and capabilities of the city, the Kyiv Technical University, and the Sikorsky Challenge project to implement projects for the innovative development of Kyiv. Solving the problems of the city will involve, in particular, creative scientists, engineers, entrepreneurs, and students, who are important stakeholders in*

this process. This will help the introduction of new technologies and services. And also — to attract investments, grants, and sponsorship at the local and national levels (Interviewee 5).

Conducting the interview method made it possible to realize that an integrated approach is important in improving and creating new services for the population: it is necessary to think over the priority and sequence of providing services and their interconnection. This will also be a significant resource saving, especially in a war.

The problem is that we are running after technologies and their early implementation. Sometimes you have to stop and rethink projects. First, it is important to consider conceptual things: transport modeling, route modeling, road building, and parking, and then implement digital technologies. We develop it the other way around. I like the countries of the East that are being built from scratch and think through everything conceptually (Interviewee 1).

I like the experience of Japan, where all services are in one application, which is a convenient, fast, and secure approach. For example, if I want to register my child in a kindergarten, I will find the location of the nearest one through the application, and reserve a place. The application will offer route options with the appropriate fare, and also a park one. Moreover, in the context of the deteriorating ecology in the country, we will encourage the population to be more environmentally friendly and the application will have the option to choose such (Interviewee 5).

Consequently, in war conditions, the human-centric approach prevails and most experts agree that the emphasis should be on IDPs. At the same time, assistance should not be limited to supporting IDPs. Because even among the IDPs there are those who need more help. Therefore, it is wise to think about the registry and assistance to others, including veterans, persons with disabilities, and the underprivileged.

We need to look more broadly and take into account the different categories of the population affected by the war. Therefore, it is important to create a system that will allow the collection and analysis of data on these categories and their needs (Interviewee 5).

6.2 The need for smart city's support of different categories of citizens faced the war

The drama of war is mass displacement, but at the same time, I notice the development of a smart city. The deal is that the connection between development and displacement is a two-way street. Population movements and displacement are influenced by development. Implications for development are reflected in families, communities, and nations; development stagnation presents pressures such as poverty, poor governance, and political instability, which increase vulnerability to

humanitarian crises and drive people to flee in search of safety. As populations migrate, host communities may experience changes that impede economic, social, and human development; however, can the gap between displacement and development plans be bridged to benefit IDPs and host communities? (Saied & Rodionovskaya, 2019). IDPs face challenges in the following areas (Fig.6.2):

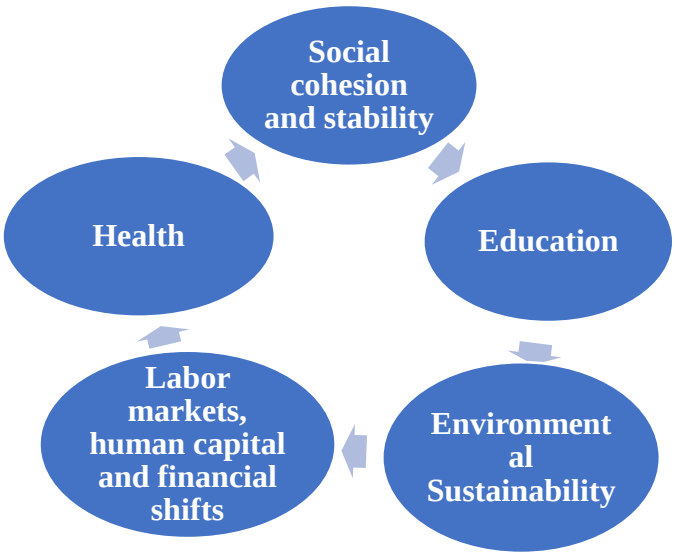

Figure 6.2. Areas needing change as IDPs grow

Source: built on the author's ideas

It is prudent to consider the experience of war-torn countries where governments helped IDPS to solve their problems. Arab countries are the first example. There are two common transformations in these countries to create smart and sustainable cities, the Greenfield model (cities are created from scratch) and the Brownfield model (applied to existing cities) (Ibrahim et al., 2015; Amitrano, 2014), and only three countries with successful strategic plans and regulatory frameworks on the use of ICT technology for transition to smart and sustainable development in various spheres. In recent years, the unstable situation, various conflicts, and political developments have impacted economic performance and development.

Given the increased number of IDPs and the need to return refugees currently abroad, state and local authorities put their interests first. In turn, according to recent research, opening labor markets and other livelihoods to displaced persons can bring several benefits, and in some cases, local host complexes can benefit from IDPs who have a scientific level of good work in the health services, schools, and other institutions *(Saied, 2019*).

> *Evaluation of statistics on the flow of IDPs, and fixing their needs by social and sociological services can serve as a source for determining the directions for the development of the concept*

of a smart city for temporary visitors to the city, in particular tourists (in the post-war period) and IDPs who wish to integrate into the urban community of the place of stay (Interviewee 3).

Despite the initiative not providing for IDPs, all experts argue that this category of citizens requires more attention. However, the level of satisfaction with their needs is low:

However, the first need is accommodation. While the existing electronic resources do not provide the possibility of a special and/or quick search for social housing for citizens, this creates tension, given the need for IDPs to independently search for suitable housing on a common basis in an unfamiliar city and urgently. At the same time, the income level of such persons, as a rule, does not correspond to the level of market prices for rental housing in the city. The same reservation is also valid for military families who are temporarily (due to the service of family members) in cities that are not the cities of their origin (Interviewee 2).

Smart city developers offer the following solutions for improving work with IDPs:

Here is the next situation. If we take the Ukrainian legislation, then this is not the task of the communities, but the task of the state level (registration of IDPs, provision of services). In my opinion, this should be done at the city level. Because the city is closer to the person. Unfortunately, I didn't see anyone doing it. And, in my opinion, first of all, the following should be done:

1. Register of IDPs;

2. Electronic services (incl. register, financial assistance, employment service). By the way, I am the head of the smart city committee in the public council under the Ministry of Transformation, where I raised these issues. But at what stage of implementation they are now, I cannot say. But such services need to be done (Interviewee 1).

Unfortunately, although the Ukrainian government has experience dealing with IDPs, their numbers are not the same as in 2014, since in 2022 there was a full-scale Russian invasion of Ukraine.

There are two different opinions among experts regarding the Register of IDPs. My study led to the conclusion that it exists in Kyiv, but does not work at the appropriate level, as in other countries:

I can give examples of other countries, including European ones, where services were created for Ukrainian refugees (first on Google Drive, and then — electronic services). You can register, get a visa to stay in the country, stand in a queue for employment, register a child in a kindergarten, etc.). Unfortunately, there is no such thing in Ukraine. And we have about 8 million IDPs, and I did not see a systematic approach to solving these problems. Everything is

in paper form and works, but not in electronic form. I don't understand why this is not being done (Interviewee 1).

Therefore, it is appropriate to consider the foreign experience in the context of supporting IDPs (subsection 6.3).

6.3 Opportunities to adapt foreign experience in supporting IDPs

Because the entire territory has been devastated and there is currently no infrastructure, it must be rebuilt from the ground up, and certain innovations must be implemented. The needs and demands of the population should be prioritized in this process. International experience shows us the directions that should be considered for each sphere (table 6.1).

Table 6.1. Measures to be included in the Smart City concept for helping IDPs in Kyiv

Spheres	Directions and measures
Social cohesion and stability	− Providing international assistance to host communities in order for them to achieve development and the subsequent steps towards becoming a smart city. − To put in place policies based on the principle of non-discrimination in order to achieve social inclusion and eliminate the causes of social conflict. − Encourage emergency and extended emergency response procedures to be decentralized in order to build local capacity.
Health	− Increasing the capacity of existing health facilities and making improvements that will have a positive impact on community development in the aftermath of more sustainable solutions. − When IDPs are unable to access these services in host communities, provide specialized local services to meet their mental and psychological health needs. − In order to strengthen health systems, involve displaced people in the provision of health services.
Education	− Improving Existing Infrastructure. − Provide long-term solutions for increasing educational attainment. − Engaging displaced people in the strengthening of educational systems in countries to alleviate the burden on the educational system caused by displacement.
Labor markets, human capital, and financial shifts	− Adopting and implementing the necessary legislation. Leveraging the expertise and capabilities of displaced people to advance the development of critical sectors and fill the gap in basic services. − Encourage commercial banks and insurance companies to provide business development services. − Conduct quantitative and qualitative research on the economic impact of IDPs on host communities to assist the state and other actors in developing livelihood strategies in emergency and chronic crises.
Environmental Sustainability	− Integrating environmental sustainability considerations into local and administrative development plans from the start, with the goal of reducing environmental damage later on. − Providing financial and technical assistance to the population for water conservation, sustainable agriculture techniques, and access to renewable energy resources to avoid tensions caused by a lack of resources and improve the ability to achieve development goals and move towards a smart city. − Educating the local community and those who have been displaced about the effects of environmental degradation on all of us.

Source: built on author's ideas

The Smart City concept provides various opportunities for different countries through smart applications. Cities in developing countries urgently need to provide appropriate urban infrastructure to keep up with the growing urbanisation of social processes and infrastructure requirements. Smart infrastructure applications enable such cities to stay ahead of technology. The application of smart city technologies frequently necessitates a robust, dependable, and affordable infrastructure, communication and information technology networks, an efficient Internet ecosystem, and the ability to leverage large amounts of data.

One popular technique is to aggregate the flow of information and data in the city. These centres may act as nerve, centres that help break down administrative constraints involved in the location of different infrastructure components under one roof in the form of a centre of operations is another means of integrated development. Finding the most intelligent integrated infrastructure development methods for smart cities may lay the groundwork for envisioning smart city infrastructure systems.

As a result, cities need to create a comprehensive database to aid in the analysis of the population's needs and requirements through technology and service sensors before they occur, and as a result of the treatment of young people using modern communication and information technology and communications.

Bringing together smart technologies, planning, and development of intelligent technologies have the potential to alter the nature of infrastructure, allowing cities to operate more efficiently and with fewer resources. This means more capacity for low-income cities that still need to address basic service gaps in cities with large old systems. This is an opportunity for intelligent building from the beginning, making it a reality, and making significant progress in development.

The technological infrastructure must be modular and adaptable to the city's growth. Most cities have limited finances, personnel, and expertise. The roots of smart application strategies must be values that the population desires, and public involvement from the start, rather than only after the sudden emergence of specific applications, can reassure society's acceptance and make it feel that transformation is a natural development rather than a forced change (*Woetzel, et al., 2018).*

Smart cities cannot simply be transplanted from one location to another. Smart infrastructure concepts must be locally tailored and responsive to local development needs. Appropriate technology, such as traditional intelligent transportation systems approaches involving a vast network of sensors and data collection, may be prohibitively expensive and unsuitable for the needs of developing countries; instead, more local and simpler versions of intelligent transportation systems may benefit more than phones.

Woetzel et al. (2018) think that mobile should be everywhere to collect data, which may be more appropriate for policies in developing countries. If the city is to benefit from its intelligence, it must serve all of its people. When cities select applications and follow-up programs, the needs of marginalized groups and disadvantaged neighborhoods are prioritized. Cities also increase digital literacy and improve access to the Internet and affordable smartphones to ensure access to the benefits of Smart Living solutions. Based on my investigation, other main measures should include the following:

1. Adaptation of an active participatory approach to smart city development, actively engaging citizens at all stages of development and ensuring that culture and livelihood factors are properly integrated into all sectors of society in smart city design and planning. For example, people can evaluate the importance of obtaining information using mobile applications.

> *While receiving push notifications, people evaluated the importance of the information and could answer whether it was helpful to them. Thus, people were involved in the operation of the smart city during the war (Interviewee 1).*

2. Cooperation with all relevant stakeholders to identify the smart city concept and vision in relation to local contexts and can help respond to specific local site needs of sustainable urban development, integrating smart city programs at the national level.

> *For example, in the first months of the war, small and medium-sized businesses (which usually need more financial resources) came to the rescue. While many shops, gas stations, pharmacies, and other vital establishments were temporarily closed, those that were open and thus able to provide people with food and medicine reported their location and opening hours. Moreover, private carriers provided free travel on some routes, and ISPs provided free services in shelters, which helped people receive timely alerts and stay in touch with their families (Interviewee 4).*

3. Adaptation of an integrated approach to visualizing and designing smart cities and infrastructure in order to promote more efficient resource use and public service delivery.

> *Mapping of hideouts, pharmacies, gas stations, and "special centers" (where you can safely charge devices and get various types of assistance). This was very important in the first month of the war (Interviewee 1).*

4. Incorporating principles such as flexibility, sustainability, interoperability, flexibility, risk mitigation, and safety into the design and development of cities and the smart infrastructure

environment. Integrate ideas obtained from historical data into smart cities and infrastructure control processes by providing data on time and effectively using it in the policy.

When dealing with displacement issues within the framework of development plans, ministries responsible for the development, finance, urban planning, employment, education, health, and environmental care, as well as ministries responsible for policies and programs for refugees and internally displaced people, should be involved.

Civil society should be involved as well, particularly humanitarian organizations that provide assistance to this group of people, as well as representatives from municipalities and others who are familiar with the impact of displacement on local development. An integrated approach is an effective tool for capturing dynamic relationships between people, policies, and environments, and it is frequently useful and effective when scientists from multiple disciplines share their work with policymakers, planners, managers, civil society representatives, and all other stakeholders.

VII. DISCUSSION

The purpose of this master thesis is to analyze how the smart city of Kyiv project was influenced by war and ways to balance security and resource-saving, taking into account the needs of citizens.

The key questions of my master's thesis are as follows:

1. How is the smart city of Kyiv project influenced by war?

2. How to achieve a balance between security and resource-saving in a smart city in the war?

3. How can smart city development help IDPs meet their needs and solve their problems?

First, smart city development is a very popular topic and many scientists have dealt with this issue. At the same time, developing a smart city in peacetime and war are two different things. In conditions of insecurity, the developed structure of a smart city can help its residents, which is what a smart city is focused on in its human-centric approach.

Second, my theoretical contribution was precisely in the search for advantages that translate into measures to ensure the priority problems of people in a war. The idea of a "smart city" has many components, including smart people, smart collaboration, smart governance, smart technology, smart energy, etc. Smart energy is a cutting-edge method for managing networks and communications while distributing and storing energy (Mir and Ravindran, 2017). For better-understanding notions of smartness in KSC before and during the war, I put them in Table 3.1(section III).

In my work, I have explored that smart technologies can help cities improve some important indicators of quality of life by 10-30%, in particular, cities can use digital applications to improve various aspects of public safety.

Therefore, projects that increase the safety of citizens and provide equipment for shelters or their modernization are extremely important in war conditions. Equally important due to damage to energy infrastructure facilities are energy-saving measures. Therefore, one of the key issues of the "smart" city of Kyiv in the conditions of war is to find ways to balance human security and resource conservation.

Thus, conducting an expert interview and studying the relevant literature made it possible to focus on the search for extremely important measures to ensure the safety of citizens ― on the one hand, and on the other ― resource-savings.

Thus, my investigation is distinct and debatable because I take into account two opposing things: on the one hand, new smart city technologies that support growth and development, and on the other hand, the detrimental effects of outside factors which are destroying these smart cities. War may also

serve as a catalyst for creating new technology to counteract later drawbacks, as I have already explained.

Third, in addition to taking into account the idea of a smart city, its guiding principles, and its participants in urban planning, I also added to prior theoretical research with changes brought on by the war and what needs to be done to ensure security (first and foremost, human lives) while simultaneously saving resources (energy, funds, etc.). To stay competitive and achieve sustainable growth, cities must find methods to boost productivity and reduce spending while maintaining a good quality of life for their citizens (Carbonnell, 2015). This was difficult but was made feasible by conducting a thorough review of Ukrainian practice and global experience in the development of smart cities.

Today, there is insufficient scientific research on war-related topics in smart cities in the 21st century. Therefore, I looked at the experience of other countries that faced disasters and, based on their experience, were able to build their cities almost from scratch and turn them into smart cities. Medellin (Colombia) regularly comes up as a standard by which any city's transformation goal should be assessed when experts join together to discuss the path to smarter cities. Following an economic crisis (Detroit, USA), civil conflict (Kigali, Rwanda), or environmental disaster (Christchurch, New Zealand, and Tokyo, Japan), this sense of urgency is felt in many cities throughout the world (Cathelat, 2019). Creating the greatest level of security for a pleasant life and resource-saving techniques are all part of this experience.

Thus, foreign experience shows that resource-saving solutions include implemented initiatives to combine technology and people; creation of "green" and "smart" construction laboratories; energy resource management systems; methods for incorporating technical and social development into the overall improvement of everyday life; robotic systems that help logically use resources before danger (Mace,2017; Davis, 2017; Rich et al., 2017).

Despite this, these measures are debatable for implementation in Ukraine (since not all disasters are human-made), and in some cases, their use may be irrational. But simultaneously, these countries survived the disasters and created these events based on their experience.

Fourth, to answer the question of how is the smart City of Kyiv project influenced by war I analyzed notions of smartness in KSC before and during the war and put them in Table 7.1.

Table 7.1 The notions of smartness in KSC before and during the war

The notions of smartness in KSC	Before the war	During the war
Smart People	Less focused on smart people	More focused on smart people
Smart Collaboration	SMEs benefit	SMEs help
Smart Governance	The government provides comfortable and high-tech technologies to the citizens	The government is looking for new ways to ensure security and save resources
Smart Technology	More focused on smart technology	Less focused on smart technology
The main goal	Fast technology adoption	Security and resource-savings

Although the data in this table is logical and makes it possible to understand the differences in the development of a smart city, at the same time, some of them are not unambiguous and may change places. Problems that caused a security risk were the country's civil conflict, unemployment, criminality, alarming murder rates, repeated natural disasters, and earthquakes. It helped me to put the measures to meet people's needs in 2 groups: (1) solutions for providing security and (2) solutions for resource savings (Mace, 2017; Davis, 2017; Rich, 2017; Veselitskaya et.al., 2019; SmartCity Press, 2018).

First, among the resource-saving measures, the most important are those related to energy conservation due to significant damage to power plants. In addition to energy-saving technologies, I also considered the possibility of saving financial resources. While interviewing representatives of the KCSA, I found out that up to 50% of the project for the development of a smart city can be financed from the local budget. This means the government must look for other ways to attract additional resources.

As a result, the initiatives currently underway require additional funding from the private sector. When attracting private capital, part of the budget is released and can be directed to implementing other strategic and important projects in smart cities.

Thus, involving the private sector is a key component of the transition to smart cities plan since it will provide finance, technical know-how, and innovation to support public sector initiatives. It is also thought to have surmounted the social and technical challenges related to natural resource dynamics and rural development initiatives, according to Ros-Carmenado et al. (2016).

The private sector assisted the Kyiv local administration during the most difficult and uncertain month of the war. As a result, certain private carriers offered free passage to people on specific routes. No doubt, the Kyiv government provided free public transit, but the assistance from the private sector

was unexpected for the local government. Furthermore, the five Internet suppliers offered free shelter services, and individuals could get notices and contact their families on time.

Second, the results of the interview added to the list of stakeholders in the development of a smart city in a war. More actors should be added to the mix to enhance adoption and foster more creativity with the given data (public agencies of different countries, scientific organizations, and world experts, students). International technical support may be supplied directly or indirectly through an agency. Donors donate funds to these organizations, and financial consultancy firms are also involved.

Conducting interviews among smart city developers made it possible to clarify that PPPs are used for the Electronic Ticket project and Electronic Parking. However, there are several disadvantages to using the PPP tool because of certain conflicts and underdevelopment of the legal structure.

Third, these days, more research points to the need to concentrate on smart city development strategies, and in times of war, smart cities may aid people, particularly those who need assistance most, by providing solutions to their issues. As a result, in times of war, the human-centric approach dominates, and most experts believe that the focus should be on IDPs.

At the same time, help should not be restricted to IDPs. It is necessary to study IDPs in detail: some are veterans, people with disabilities, or people from low-income families and therefore need more help than others. That is why different categories of citizens affected by the war need to be considered. Moreover, it is important to create a system that will allow the collection and analysis of data on these categories and their needs.

Forth, among different measures incl. Internet of Things, Digital twin, Geoinformation technologies, "Smart" street cameras, "Smart energy", and "Smart houses", the most important and effective one is Environment for secure Internet data exchange between information systems.

One of the successful options is creating local connectivity by constructing a private network, which will be safer and more cost-effective considering the cheap cost of the Internet in Ukraine. Furthermore, such a system will make it easier and more efficient to collect data about critical and transportation infrastructure and the number of people living in certain locations and their needs. Furthermore, this connectivity might be offered as a service, and funds for its use will go to the budget.

Fifth, conducting the interview method made it possible to realize that an integrated approach is important in improving and creating new services for the population: it is necessary to consider the priority and sequence of providing services and their interconnection. This will also be a significant resource saving, especially in a war.

To successfully implement this idea, first of all, it is important to think about conceptual things: transport modeling, route modeling, road building, and parking, and then implement digital technologies. Next, all services should be in one application, which is a convenient, fast, and secure approach. Moreover, in the context of the deteriorating ecology in the country, people can be encouraged to be more environmentally friendly and the application will help to achieve this goal.

VIII. CONCLUSIONS

The goal of this master's thesis is to examine how the smart City of Kyiv project was impacted by war, as well as strategies to balance security and resource-saving while considering citizens' requirements. Collaborative Governance was chosen as a theoretical framework for the conceptual basis, which helped better theoretically support the acquired outcomes.

During the research, 5 interviews were conducted with different experts. Therefore, this work can reveal how to achieve a balance between security and resource-saving in a smart city during the war, and how can smart city development help IDPs meet their needs and solve their problems.

8.1 Theoretical and practical contributions of this study

This work harmoniously complements other scientific contributions in the field of smart city development: smart people, smart technology, and smart collaboration (Praharaj et al. (2018), Appio et al. (2019, Baron (2012), and Meijer and Bolvar (2016).

All the experts agree with creating maximum security for a comfortable living and ways to save resources. To complement their ideas, I investigated the international experience of a smart city under disasters (Mace (2017), Davis (2017), Rich (2017), Veselitskaya et.al. (2019), and SmartCity Press (2018)).

Foreign experience shows that resource-saving solutions include implemented initiatives to combine technology and people; the creation of "green" and "smart" construction laboratories; energy resource management systems; methods for incorporating technical and social development into the overall improvement of everyday life; robotic systems that help to logically use resources in the face of danger; ways to save financial resources.

But this international experience is based on the disaster, not the war. Because in the 21st century, it is difficult to find a smart city that has experienced the same thing that Ukraine is now facing. Thus, not enough research has been conducted on the impact of the war on smart city development.

My work emphasizes Russia's full-scale invasion of Ukraine in 2022; so, the priority is a human-centric approach, rather than a technocentric one, as before the war. In my research, I also focus on a certain group of individuals ─ IDPs who have suffered the most. Furthermore, it was remarkable that the business sector aided the local administration during the war's most challenging and uncertain first month. Collaborative Governance was employed as the conceptual framework for this case study.

Thus, the ways to balance security and resource savings in times of war include the following.

The first one is the use of PPP. During my research, I concluded that according to the KCSA, 50% of initiatives can be financed from the local budget, and the remaining part is financed from other sources. Therefore, looking for ways and means to attract additional resources is necessary.

As a result, the initiatives currently underway require additional funding from the private sector. When attracting private capital, part of the budget is released and can be directed to implementing other strategic and important projects in smart cities.

A smart city is characterized by a coordinated dynamic of smart technologies and public-private cooperation. From a theoretical point of view, the PPP is an essential component of neo-liberal reforms, such as the new public administration, which emphasizes the participation of the private sector in public decision-making and service delivery. The PPP can help cities finance some projects and ensure that programs are completed on time and on budget, although combining these two separate components can be controversial in practice.

And no doubt that in peacetime and during the war, SMEs can perform different roles. If the state helps SMEs in peacetime, then during the war they change places and, in turn, the SME helps the state. Thus, in the first month of the war, which was the most complex and uncertain, the SME helped the local government (some private carriers provided free travel for citizens; the five ISPs also provided free shelter services). I believe this experience would be helpful for other countries facing similar challenges.

The second one is providing benefits to projects to improve human security and energy saving. Extremely important in war are projects that improve the security of citizens and provide equipment for shelters or their modernization. Preference should be given to social projects aimed at improving the living conditions and social adaptation of people.

At the same time, due to damage to energy infrastructure facilities, energy-saving measures require no less attention. In the process of my research, I came to the conclusion that the alternatives could be the following: first, "Points of indestructibility" where people could charge their mobile devices, keep warm, use mobile communications, the Internet, and even first aid; second, installing solar power plants on the roof of buildings will save electricity.

But the best approach to saving resources and ensuring security is the experience of Australia. Given the low cost of the Internet in Ukraine, creating local connectivity by building a private network will be safer and more economical. Such a system will also provide convenience and efficiency in collecting data on critical and transport infrastructure and the number of people living in certain areas and their needs. Moreover, this connectivity can be provided as a service and the proceeds will go to the city budget.

In addition, local connectivity will also help resolve the issue of understanding the needs of different kinds of citizens. The fact is that this innovation will allow for keeping records of the population and studying its structure and needs. As explored earlier, it is also essential to distinguish between different categories within the IDPs, and, accordingly, assistance can be different.

Whatever services are provided, everything should have an integrated approach and a well-thought-out algorithm from start to finish. Here it is advisable to consider foreign experience. The countries of the East are being built from scratch and think through everything conceptually, and the experience of Japan shows that all services are in one application, which is a convenient, fast, and secure approach.

8.2. Limitations and suggestions for further research

My study makes theoretical and practical contributions, but at the same time, it has certain *limits*. Firstly, no studies related to developing a smart city during a war. The scientific literature contains only theoretical and practical research done in peacetime. Therefore, I analyzed the experience of countries that faced problems of the same magnitude ― disasters that threatened/threaten the population.

Secondly, websites with official information on the smart city of Kyiv are closed, as well as financial information. In addition, a lot of information is not updated because the priorities in providing information to external users have changed.

Thirdly, the political aspect cannot be ignored. I interviewed those who developed the smart city before the war and who had to develop it during the war. Therefore, in some situations, experts could give a positive assessment of their actions and show only a positive side, and vice versa, speak negatively about their predecessors or those who continued their work. But, at the same time, in my research, I was looking for arguments and studying the relevant literature and data to understand everything.

Forth, nevertheless, I was able to conduct interviews, which was very difficult to do. The fact is that information relating to security is closed in wartime. Therefore, I am deeply convinced that my research will be also the basis for further research in the context of smart city development in war conditions.

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APPENDIX I

Professional background of interviewees

№	Position (on the date of interview) or previous positions	Type of interview	Duration
1	Head of Smart City.UA	Zoom meeting	45 minutes
2	Deputy Head of Department of Budget, Taxation and Banking, Main Scientific and Expert Department of the Verkhovna Rada of Ukraine	Zoom meeting	30 minutes
3	Chief consultant, National Institute for Strategic Studies	Zoom meeting	30 minutes
4	Kyiv City State Administration, Main Information and Computing Center, Deputy Head of the Project Management Department of the Municipal Enterprise	Zoom meeting	1 hour
5	Kyiv City State Administration, CIO Advisor at Kyiv City Council	Zoom meeting	50 minutes

APPENDIX II

Invitation for interview

My name is Mykhailo Sharkov, and I am a student and young researcher. I am pursuing a dual degree at Taras Shevchenko National University of Kyiv and Nord University in Norway. I am now working on a research study on the optimisation of state budget expenditures in Ukraine during the crisis.

I'd want to hear your thoughts on the significance of this practice in Ukraine. I would be happy if you could take 10-15 minutes to complete my questionnaire and provide me with your feedback! If you choose, your contact information will not be included in the study, and you will remain anonymous.

Before beginning the interviews, I outlined the goal of my research, the fundamental concepts, and the areas of state budget expenditures I wanted to learn about.

Furthermore, I asked the experts to rate the relevance of each topic and provide their own opinion. The rating was based on a five-point scale: 5 - for very good, 4 - for good, 3 - for adequate, 2 - for bad, and 1 - for very poor. This was done at the beginning of the study to determine the major essential concepts and concerns of the experts. The survey findings assisted in determining which areas of research in this field are significant and in forming an understanding of the concerns to focus on during the interviews.

Following the preliminary step, there was opportunity for a rough guide for conducting interviews.

APPENDIX III

The interview guide

General questions of the project and the interviewer:

- What is your work experience?

– What is your position and area of responsibility in the Kyiv Digital / KyivSmartCity / SmartCity.ua project?

– How long have you been working in the field of smart city?

- Is the development of a smart city within the scope of your professional activities and responsibilities?

– How many people work with the project and what are they responsible for?

Kyiv Digital / KyivSmartCity / SmartCity.ua Project:

– How would you characterize the Kyiv Digital / KyivSmartCity / SmartCity.ua project? What is the main goal of the Kyiv Digital / KyivSmartCity / SmartCity.ua project?

– Where do ideas come from? And how are they implemented?

- Do you use the experience of other countries in the development of a smart city? Please provide examples.

– What are the results of the Kyiv Digital / KyivSmartCity / SmartCity.ua project?

What do you think could have been done differently and why?

The main interested parties (stakeholders) of the Kyiv Digital / KyivSmartCity / SmartCity.ua:

– Who takes the lead and responsibility for the development of Kyiv Digital / KyivSmartCity / SmartCity.ua?

– Who influences the development of a smart city? Please name the main actors (stakeholders) influencing the development of Kyiv Digital / KyivSmartCity / SmartCity.ua?

– How do you involve local residents in the project?

– Who is funding the project? Do you have any reports that I could take a look at?

- Could you give examples of public-private partnership in the context of the Kyiv Digital / KyivSmartCity / SmartCity.ua project?

The impact of a full-scale war in Ukraine on the Kyiv Digital / KyivSmartCity / SmartCity.ua project:

- How can you analyze the differences in the development of Kyiv Digital / KyivSmartCity / SmartCity.ua before the war and after the war? How does the war affect the development of Kyiv Digital / KyivSmartCity / SmartCity.ua?

- Are there any achievements of the pre-war development of a reasonable city that came in handy during the war?

- Do you have additional projects that meet the needs of today? Are there any initiatives of the Kyiv Digital / KyivSmartCity / SmartCity.ua project that no longer make sense and why?

- Do you conduct additional research on the development of a smart city in a war?

– What are the priority measures to improve the development of a smart city in a war?

How to improve the development of a reasonable city during the war? Internally Displaced Persons (IDPs) and Kyiv Digital / KyivSmartCity / SmartCity.ua:

– Does Kyiv Digital help citizens during the war and how exactly? Do you have any good examples?

- The problem of IDPs is essential for Kyiv. Are there any additional services that have become available and important to IDPs since the start of the all-out war?

- Are the needs of IDPs taken into account in the development of a smart city? If yes, what documents provide for it?

- What documents need to be amended to take into account the needs of IDPs?

- What are the needs of IDPs?

- How can IDPs improve the development of a smart city?

- And what are your main conclusions, lessons learned from this period (after February 2022)?