SELINUS UNIVERSITY
OF SCIENCES AND LITERATURE

Assessing the Influence of Public-Private Partnerships in Smart City Innovations: A Practitioner's Perspective

By Mohannad Salam

A Dissertation presented to the

Department of Business Schoool

in fulfillment of the requirements for the degree of

DBA in Innovation Management

2023

Table of Contents

List of Figures

List of Tables

Chapter 1.0. Introduction

1.1 Background of the Study

This section provides an overview of the research topic and expounds on the importance of studying the influence of Public-Private Partnerships (PPPs) on city innovation from the experienced view of a consultant and practitioner in the field. PPPs are collaborations between a public agency (government) and a private sector entity. These alliances are set up to support the funding, construction, and operation of initiatives and services that address societal needs. These initiatives may include social services like neighborhood improvement, education, and healthcare, as well as infrastructural initiatives like building roads, bridges, and hospitals. PPPs are a solution to address general requirements while maximizing efficiency and effectiveness and using both public and private resources. PPPs ensure that the private and governmental sectors execute projects jointly such that the profit objectives of the private organization are met and the project objectives and terms of reference for the public sector are met concurrently as both sectors share the risks, resources, and costs of implementing the project (Hodge & Greve, 2017). Smart cities are urban environments that utilize technology and data to improve the lives of city residents through optimized city operations and efficient service delivery (Silva et al., 2018).

PPPs have become an increasingly popular tool for governments to use when attempting to innovate in the smart city sphere. PPPs involve a collaboration between the public sector, often represented by city governments, and private sector organizations, such as corporations, non-profits, and universities, who come together to develop digital city solutions. The goal of PPPs is to leverage both parties' resources, capabilities, and expertise to tackle complex urban

problems effectively. In recent years, PPPs have been employed in various capacities, from funding and developing digital city projects to providing technical assistance and expertise (Gorelick & Walmsley, 2020). While PPPs have become increasingly popular, much is still to be learned about their effectiveness and impact on digital city innovations. This research examines the influence of PPPs in digital city innovations from a practitioner's perspective.

A new International Finance Corporation (IFC) analysis highlights the value of PPPs for digital city development. The paper proposes that PPPs are the way to go to tackle tough urban issues and implement innovative solutions. Combining municipal assets with private sector capacities and funding has sped up the creation and rollout of digital city initiatives. Access to funding, project management, efficiency, and innovation are all highlighted in the IFC study as possible advantages of PPPs (Rodrigues & Zucco, 2018). Because of these advantages, smart city initiatives may be designed to be more productive and beneficial for residents. Moreover, the paper argues that PPPs may aid cities in identifying, prioritizing, and developing smart city initiatives and managing and monitoring their development (Rodrigues & Zucco, 2018). This may be useful for identifying citywide issues and generating workable plans to remedy them. The IFC study is only one illustration of how PPPs may spur smart city innovation. PPPs can be a useful tool for cities to use in their quest for digital city innovation, as they can aid in the selection and prioritization of projects, the management of those projects, the tracking of their progress, and the utilization of private sector resources and expertise. When communities do this, they increase the returns on smart city investments and guarantee that residents get the advantages.

The IFC report proposes that PPPs can assist urban areas with distinguishing, focusing on, and fostering savvy city projects and oversee and screening the activities' advancement

(Rodrigues & Zucco, 2018). This can be advantageous in assisting urban communities with recognizing the most squeezing needs and fostering compelling arrangements that address those requirements. The IFC report outlines the potential benefits of PPPs, including improved access to financing, improved project management, greater efficiency, and greater innovation (Rodrigues & Zucco, 2018). These benefits can help cities to develop more efficient and effective smart city projects that deliver greater value to citizens. Furthermore, PPPs can also help cities access new technologies and improve their innovation ability. A study by Yigitcanlar et al. (2020) found that PPPs can help cities access new technologies, such as IoT, ML, and AI. This can enable cities to develop more innovative solutions to urban problems. Yigitcanlar et al. (2020) also found that PPPs can help cities build the capacity needed to develop and implement digital city projects. This can enable cities to develop and implement more effective solutions to urban challenges.

The demand for improved service and goods delivery to citizens has sparked an increase in collaborations between the public sector and private organizations with a common goal of meeting these demands (Ferraris et al., 2018). Governments prefer the collaboration between the private and governmental sectors due to its effectiveness in ensuring that value-for-money is achieved and usually runs through the project life from initiation to closure when all project data, products, and information are handed over to the government by the private consulting organizations (Bao et al., 2018). PPPs provide a pool of resources and skills required to implement innovative digital city projects (Lam & Yang, 2020).

This research explores the multifaceted interactions between PPPs and smart city innovations and developments from the view of smart city practitioners and consultants. The study proposes a conceptual model through which the interactions between smart cities,

innovations, and PPPs can be reviewed to provide insights into the degree of influence of PPPs on digital city innovations from a consultant's perspective. The study provides insights and a better understanding of the influence of PPPs on the performance and success of smart city projects and the challenges facing this collaboration.

1.2 Problem Statement

Despite an increase in the application of PPPs in implementing digital city projects, there is a limited understanding of the influence of PPPs on the success, performance, and sustainability of these projects. This research addresses this gap by providing knowledge on the role of PPPs in digital city innovations, the advantages, and the challenges. The research identifies best practices for successful collaboration between private and governmental sectors in implementing city projects and contributes to existing research on the influence of PPPs on smart city innovations. PPPs could be effective in implementing smart city projects, as they allow for leveraging the resources of both the private and governmental sectors. The projects can therefore access a wider range of specialists, resources, and expertise and successfully complete projects. Furthermore, the research identifies how PPPs could benefit the long-term sustainability of digital city projects, as they allow for sharing of rewards and risks between the private and governmental sectors. However, the research also identifies challenges associated with PPPs, such as complex and lengthy negotiations between parties and difficulty creating an equitable and fair agreement between both parties. Additionally, the research highlights that there are often difficulties in aligning the interests of both the private and governmental sectors, as the objectives of both can be very different.

Most of the research and data available on the influence of PPPs on digital city innovations have come from an academic perspective. The purpose of this research is to provide practical

insight into the long-term effects of the partnership between the private and governmental sectors in digital city initiatives and the adoption of innovations from a practitioner's viewpoint. The research aims to construct a conceptual model that would instruct practitioners on how to properly establish and manage such connections by supplementing the outdated and sparse material already available. The procedure includes the evaluation of pertinent literature and the creation of a conceptual framework. The conceptual model created for this project serves as a map for quantifying the effects of these collaborations on the development of ideas for smart cities. It provides important insights into the significance of public-private sector partnerships, the need for good communication, and the requirement for defined goals.

1.3 Research Objectives

- To assess the influence of PPPs on the success, performance, and sustainability of digital city projects.
- To identify the best practices for successful collaboration between public and private sectors in implementing smart city projects.
- To explore the multifaceted interactions between PPPs and smart city innovations and developments from the view of smart city practitioners and consultants

1.4 Rationale Statement

This study examines the influence of PPPs on smart city innovations. Smart cities are an essential focus for addressing the issues of economic growth, sustainable development, and population growth in urban areas. Due to the complex and costly nature of implementing smart city projects, PPPs provide an avenue for ready-made solutions regarding funding,

expertise, resources, and risk management. This study aims to bridge the gap in limited knowledge on the impact of PPPs on digital city development by providing a practitioner's view on the topic. PPPs could be an effective tool for developing smart cities; furthermore, involving stakeholders early in the project planning and providing incentives for private sector involvement are key factors for success. However, a lack of trust and transparency between public and private actors can lead to cost overruns, project delays, and other challenges. The findings of this study have essential implications for the future of digital city development and highlight the need for governments, private entities, and other stakeholders to collaborate openly and transparently to ensure that PPPs are successful. It also reinforces the advantage of involving stakeholders early in the project planning process and providing incentives to attract private sector involvement. Going forward, governments and private entities must work together to create an environment that encourages the development of innovative digital city solutions.

1.5 Significance of the Study

This research seeks to provide a practitioner's perspective on the role of PPPs in developing smart city ideas. The research aims to fill the knowledge gap on the effects of PPPs on the development of smart cities by offering a comprehensive understanding of the implications, difficulties, and possibilities of creating effective PPPs. The research findings shed light on PPPs' contributions to and effects on innovations in smart cities and highlight key elements necessary for PPPs to succeed in smart city projects. The study demonstrates that successful PPPs need strong partner relationships, well-defined roles and duties, and specific goals and objectives. The research also demonstrates how PPPs might improve services, open innovation doors, and make cities more resilient. The report also emphasized some of the

difficulties PPPs face, such as the lack of sufficient finance and resources, the lack of cooperation and trust between partners, and the difficulty in foreseeing how partnerships would turn out. These issues may constrain the success of PPPs in digital city programs.

1.6 Organization of the Study

This research is divided into five chapters, as illustrated below:

Chapter 1: Introduction – This section provides background information on the research, the rationale statement, the problems the research aims to solve, the research objectives, and the significance of the study in providing insights into smart cities and PPPs.

Chapter 2: Literature review – This section covers various aspects of smart cities, smart city innovations, PPPs, and existing research on the influence of PPPs in smart city innovations.

Chapter 3: Methodology – This chapter is organized into research design, research strategy, data analysis methods, ethical considerations, and limitations and delimitations of the study.

Chapter 4: Results, analysis, and discussion – This section covers data presentation, presents research findings, and comparison of the findings with existing literature findings.

Chapter 5: Conclusions and recommendations – This chapter summarizes the findings of the study, provides valuable insights for researchers, practitioners, and policy-makers, as well as makes recommendations for future research on the topic.

Chapter 2.0. Literature Review

2.1 Introduction

This section reviews smart cities, PPPs, opportunities, and challenges of these partnerships by reviewing past studies on this research topic, methodologies, and their findings. It starts with an overview of smart cities, followed by a review of PPPs in general, their involvement in smart cities, and the influence of these collaborations on smart cities innovations from a practitioner's perspective.

2.2 Smart Cities

Urban areas around the world are experiencing high urbanization rates resulting in various social problems such as high population growth, traffic congestion, and poor spatial planning, environmental challenges such as pollution and over-exploitation of resources, and economic challenges such as crimes and low-income levels (Liu et al., 2020). Smart city concepts have been developed to solve these problems. Advanced technology infrastructure, smart innovations, and big data analytics are incorporated into city development projects to ensure social, economic, and environmental sustainability (Lai et al., 2020).

Smart cities are meant to meet social needs sustainability by focusing on key areas, including a smart economy, living, mobility, governance, people, and a smart environment (Selim et al., 2018). Smart people in smart cities are characterized by professionalism, expertise, availability of institutions of higher learning, flexibility, resilience, creativity, innovation, good health, and a capacity to be open-minded (Vinod Kumar & Dahiya, 2017). The digital city economy is characterized by local, national, and global based creativity, economic opportunities, entrepreneurial leadership, market competitiveness, innovation in diverse fields and research, sharing economy, awareness of global economic opportunities,

tourism, and productivity (Vinod Kumar & Dahiya, 2017). Digital city mobility focuses on people mobility and not vehicular mobility and is characterized by cycling lanes, walking paths, efficient mass transit systems, efficient modes of transport such as railway, road, and air transport, vibrant streets, and supports mobility of differently-abled persons (Vinod Kumar & Dahiya, 2017).

A digital city environment is characterized by the availability of green spaces, watershed management, efficient integrated water, drainage, and waste management systems, green city, nature conservation and restoration activities, low carbon environment, and community sense (Selim et al., 2018; Vinod Kumar & Dahiya, 2017). Smart living is characterized by safe and sure living standards, high quality of life, strong cultural and historical values, cultural festivities, availability of public open spaces, and efficient services and social amenities (Vinod Kumar & Dahiya, 2017). Smart city governance is characterized by efficient service and development by the government to its citizens through integration technology, innovations, and big data analytics (Pereira et al., 2018).

According to Liu et al. (2020), PPPs may be used to create digital city initiatives. They suggested a conceptual framework that describes the essential elements of a PPP and the functions played by the different stakeholders. For the development of successful digital city initiatives, Liu et al. (2020) stress the need for good communication and cooperation between the public and commercial sectors. They point out that creating digital city initiatives necessitates the fusion of several technological, monetary, and legal facets. PPPs are the most effective way to accomplish this integration because they let the private and governmental sectors share resources and knowledge. The Liu et al. (2020) framework emphasizes the significance of solid legal frameworks in creating digital city initiatives. They contend that to

guarantee that the interests of all parties involved are considered, a clear legal framework should be developed. Such frameworks should specify each party's obligations and functions and the legal ramifications of any choices made. Moreover, Liu et al. (2020)'s approach highlights the significance of risk management in creating digital city initiatives. They contend that adequate risk management is necessary to guarantee a project's success.

The requirement for funding is also emphasized in the framework presented by Liu et al. (2020) for creating smart city initiatives. They recognize that substantial financial resources are usually necessary for the effective execution of such undertakings. They argue that getting enough money from the private and governmental sectors is needed to finish a project successfully. Liu et al. (2020) add that for maximum stakeholder satisfaction, the project's funds must be handled openly and responsibly. Liu et al. (2020) suggest that capacity training is critical to successfully developing digital city programs. Specifically, they advocate for training and information sharing as means of capacity development. Stakeholders will benefit most from training that is designed specifically for them, and that addresses their requirements in the areas of finance, law, and technology. Building people's skillsets helps them face the problems and opportunities of creating a smart city.

Selim et al. (2018) discussed the importance of smart infrastructure in the context of smart cities. They stated that PPPs are crucial to sustainable development in smart cities because they facilitate the pooling of public and private sector resources, skills, and money. According to Selim et al. (2018), a clearly defined legislative framework is needed to ensure that everyone's needs are met throughout the creation of smart infrastructure and that responsible people are accounted for. In addition, Selim et al. (2018) proposed a policy framework for smart infrastructure development that promotes creativity, adaptability, and

versatility. A policy of this kind should consider the social, environmental, and economic effects of smart infrastructure and guarantee that all parties involved may reap its advantages. They recommended that cities prioritize the construction of smart infrastructure by investing in the regions that most need it so that the strategy may be successfully implemented. In addition, Selim et al. (2018) suggested that cities use technology developments like AI and IoT to enhance the performance of current infrastructure. To further guarantee that all stakeholders' interests are considered, they also stressed the need for strong governance mechanisms and the formation of PPPs. PPPs might have several positive effects when used to create smart infrastructure. By combining public and private sector resources, for instance, cost savings may be realized, easing the financial load on municipalities. Using technology to expedite procedures and lessen the need for red tape also means that collaboration of this kind may boost productivity. The construction of smart infrastructure may assist in closing the digital gap amongst diverse segments of society, and PPPs can facilitate this process. For the most part, Selim et al. (2018) provide a thorough introduction to the significance of smart infrastructure in the context of smart cities and the possible advantages of leveraging PPPs in creating such infrastructure. This suggested framework may help cities go on the path to sustainable development by facilitating the creation of smart infrastructure and using PPPs.

The term "smart economy" was introduced in the context of "smart cities" by Vinod Kumar & Dahiya (2017), who provided a thorough assessment of the term. They spoke about using technology to make municipal services more efficient and how a well-thought-out strategy with input from all relevant parties is essential to making smart economy ideas a reality. Cities may boost their economies, residents' quality of life, public facilities, and access to government services by implementing "smart economy" programs. For example, by

using cloud computing and sophisticated analytics, municipal services may be enhanced by delivering data-driven solutions and real-time insights. Access to services may be expanded, and transaction costs can be reduced via mobile apps and digital payment systems. Participation from all relevant parties is essential to roll out smart economy projects effectively. Governments must ensure that their policies and laws are adaptable enough to meet the demands of the private sector. Companies should be incentivized to make technological investments and work with government agencies to provide new and creative solutions. So that their interests are considered, civil society groups should be given a voice in decision-making and have access to relevant data and information. There are several ways in which smart economy efforts might be helpful. Such actions, by lowering transaction costs and expanding service availability, may improve the effectiveness of municipal services. Economic development may be boosted due to their ability to generate new jobs and encourage firms to make technological investments. Improvements in infrastructure, public safety, and healthcare access are just a few ways in which smart economy efforts are elevating the standard of living for the general populace.

It was stated by Pereira et al. (2018) that PPPs are crucial to the rollout of smart cities. They argued that safeguarding people's rights and the interests of all parties requires establishing a clear legal framework. Also, they advocated for including all relevant parties in the digital city design process. They also suggested that PPPs may lead to more openness and accountability, higher productivity, and sound decision-making. The Dubai Smart City project, which began in 2014, illustrates how PPPs may be used to build a smart city's infrastructure successfully. Partners from the public and commercial sectors worked together on this initiative to create a smarter way of governing, making, doing business, and living.

Overall, the industry has succeeded, raising living standards in Dubai and spawning new business and employment possibilities. Potential dangers like mismanagement, increased costs, and a lack of interest from the public are all possible issues linked to PPPs. As a result, it is crucial that these risks be well handled and that the legal framework be strong enough to safeguard the interests of all parties involved. Public participation in planning is also essential for the project's objectives to be realized.

Silva et al. (2018) argued that smart cities should be designed in a sustainable manner, with a focus on energy efficiency, equitable access to resources, and the use of renewable energy sources. They proposed measures including green construction rules, increased usage of public transit, and renewable energy installations. They also stressed the need to include all relevant parties in the smart city development process and emphasized the importance of a holistic, multi-disciplinary approach. They maintained that bridging the gap between the private and governmental sectors via PPPs was crucial to sustainable development. For instance, through PPPs, businesses may access government resources and knowledge while governments reap the benefits of private companies' capital and creativity. The advantages of public-private cooperation in smart cities were also explored by Silva et al. (2018). They stated that stakeholder participation might be facilitated, and financial barriers could be reduced by establishing such partnerships. Furthermore, they argued that PPPs might improve service delivery and reduce costs. They also stressed the importance of PPPs and their potential for better governance via more openness and accountability. In addition, Silva et al. (2018) claimed that PPPs might be an efficient strategy for dealing with the difficulties of digital city construction. They hypothesized that the obstacles to implementing digital city initiatives, such as a lack of money and capacity development and a general lack of

awareness of their potential advantages, might be addressed by forming such alliances. They also suggested that public-private collaborations, via the creation of legislative frameworks and the adoption of open standards and protocols, may aid in the efficient rollout of digital city programs.

According to Lai et al. (2020), open standards and protocols that any interested party may use are necessary to effectively roll out digital city initiatives. They stressed the need for technological means to guarantee the compatibility of digital city parts. For instance, the IEEE 802.11 family of standards offers a collection of open standards for WLANs that may facilitate wireless communication between digital city components. The Open Geospatial Consortium (OGC) provides an array of open standards for making geospatial data and services compatible. It is worth noting that the International Organization for Standardization (ISO) has created a set of standards that may be used to guarantee the compatibility of digital city components. For instance, the ISO/IEC 27000 family of standards lays a blueprint for establishing and enforcing information security management systems (ISMS). In addition, the ISO/IEC 29110 family of standards also offers a framework for creating digital city application software. Standards for data sharing and interchange are essential to the smooth operation of any digital city project. One example of such open standards is the Open Data Protocol (OData), which facilitates data transfer across applications. It paves the way for information interchange between many parties, including the public and commercial sectors, and contributes to its safe and effective transmission. In addition, a set of guidelines for creating useful web apps has been established by the World Wide Web Consortium (W3C). These norms facilitate the exchange of information between many parties and guarantee that web-based apps may communicate with one another. In addition, the Open Services for

Lifecycle Collaboration (OSLC) also offers an open standardization framework for creating digital city software applications. The Open Mobile Alliance (OMA) has released an empty set of guidelines for creating mobile apps. These norms pave the way for creating programs that facilitate the exchange of information between various parties and access to data from several sources.

A recent assessment by Okai et al. (2018) on the present status of smart cities revealed that several obstacles are standing in the way of their widespread adoption. To begin with, there may be a limit on digital city development due to financial constraints. Developing nations, where money is scarce, experience this problem more acutely. Second, the effective deployment of smart cities might be hampered by a lack of stakeholder coordination. For instance, conflicts and stagnation may result when municipal governments, private businesses, and individuals have divergent goals. Finally, it might be challenging to integrate digital city technologies if people are aware of their potential advantages. It is possible, for instance, that locals are not aware of how much better off they would be if their city adopted digital city technologies like those used in Silicon Valley. Okai et al. (2018) recommended developing policies and strategies to solve these obstacles and guarantee the effective rollout of smart cities. These regulations must be developed in tandem with the city's many stakeholders and adapted to meet the city's specific requirements. For instance, to guarantee the effective implementation of smart cities, municipal administrations should collaborate with private enterprises to create strategies. Citizens should also be made aware of the potential benefits of smart cities and urged to become involved in shaping their creation. Governments should also give sufficient financing for smart city development. This will guarantee that the tools needed for implementation are made accessible.

Regarding building smart cities, Söderström et al. (2020) claim that narrative is a crucial component. They said stories could be used to get people involved in planning and gain support for smart city initiatives. With the use of storytelling, cities may craft an understandable and engaging account for a wide variety of constituencies, which in turn can boost public participation in smart city development. For instance, towns might use narratives to raise awareness of the potential advantages of smart city initiatives and foster a feeling of pride among residents. The difficulties of building a smart city, such as investing in technology, infrastructure, and human resources, may be better explained via narratives. Apart from that, individuals might be educated about the dangers of smart cities via tales. As an illustration of the privacy and security concerns associated with data collection and storage in a digital city, consider the following fictional account. Cities may increase public understanding of digital city technology's potential benefits and hazards by presenting stories to the public. In addition, storytelling may be a powerful tool for fostering togetherness among residents. A city's culture, history, and identity may all be encapsulated in a single narrative, which can be accomplished via the telling of tales. With a stronger feeling of community, residents are more likely to pitch in for the sake of their neighborhood. Last, narratives may be utilized to demonstrate the smart cities' potential advantages. Smart cities may enhance the quality of life of their residents by creating economic possibilities, enhancing public safety, and expanding access to improved services, all of which can be shown via narrative. This is an efficient method of informing the public about the potential advantages of smart cities, which may help garner more support for their creation.

To secure the long-term viability of smart cities, Ahad et al. (2020) investigated a variety of technologies and approaches. They discussed how crucial it is to implement green

building practices and switch to renewable energy sources like solar, wind, and geothermal to create more energy-efficient structures and infrastructure. They also stressed the need for PPPs in digital city growth, as these collaborations may bring in the money, knowledge, and other essential assets for digital city initiatives to be realized. They also suggested that autonomous cars and intelligent traffic control systems, both examples of smart transportation systems, might aid in the fight against pollution and the enhancement of municipal services. In addition, they argued that protecting residents' rights and ensuring a fair allocation of resources is essential to the successful implementation of smart cities. Ahad et al. (2020) claimed that developing an efficient governance system focusing on stakeholder participation and cooperation is necessary to guarantee the long-term viability of smart cities. They said that for a government to do its job properly, it needs a well-defined legal framework that can defend the rights of its population and a clear vision and set of goals. They also advised that adopting open standards and protocols available to all stakeholders is crucial to deploy smart cities effectively. They also stressed the need to create a reliable data management system to guarantee the safe collection, storage, and exchange of data.

According to Karvonen et al. (2019), smart cities can only be implemented if technology is used to make municipal services more effective. They proposed that this goal may be met by improving existing information systems like the IoT, which can supply real-time data on urban utilities and facilities. In addition, they stressed the significance of partnerships across various sectors, including the public and commercial ones, in achieving digital city goals. The potential advantages of smart cities can only be realized when all relevant parties work together to overcome any issues that may arise. The implementation of smart cities, according to Karvonen et al. (2019), requires the creation of efficient

information technologies and the adoption of suitable governing structures. They advocated for the government to spearhead the creation of smart cities while the business sector supplied the necessary technology and skills. They also stressed the need for accountability measures and policies to safeguard people's rights.

In addition, Karvonen et al. (2019) claimed that for smart cities to be successfully implemented, it is necessary to be aware of the obstacles that may need to be addressed. They underlined the need to invest heavily in technology, infrastructure, and human resources to create smart cities. They argued that knowledge of data security and privacy concerns is important to the effective rollout of digital city initiatives. A comprehensive approach to planning and the creation of suitable methods to guarantee the effective exploitation of resources is necessary, according to Karvonen et al. (2019), who concluded that this is needed to implement smart cities successfully. It was proposed that a comprehensive strategy that encourages creativity, versatility, and change serve as a compass for creating such tactics. They also emphasized the value of PPPs in bringing smart cities to fruition. These collaborations can guarantee effective resource management and fair distribution of rewards among all parties involved.

Sánchez-Corcuera et al. (2019) surveyed the present condition of smart cities and determined that substantial investment in technology, infrastructure, and human resources is necessary to implement smart cities effectively. Implementing digital city components like sensors, networks, and data management systems may be expensive, as can developing efficient transit and energy-efficient structures. In addition, realizing the advantages of smart cities and overcoming the obstacles they present are necessary for their effective implementation. For instance, it may be challenging to integrate preexisting technological

and infrastructural systems and digital city implementation requires cooperation between public and private sector actors. Data privacy and security need technical safeguards and strong legal and regulatory frameworks. The potential advantages and related problems must be weighed for the development of smart cities to be effective. To provide just a few examples, smart cities may enhance the effectiveness of municipal services, broaden citizens' access to resources, and promote environmentally responsible growth in metropolitan areas. Smart cities also can boost economic development and enhance residents' quality of life. Nevertheless, a well-defined legislative framework and buy-in from all relevant parties are essential for successful digital city rollouts. However, smart city development requires heavy investment in technology, infrastructure, and human resources, as well as an in-depth understanding of the opportunities and obstacles that must be surmounted.

According to Ismagilova et al. (2019), an efficient data management system is crucial to the rollout of smart cities. They recommended creating a unified platform where parties can freely share and analyze data. They reasoned that if everyone had access to this data, it would lead to more well-informed judgments and higher productivity. They advocated for a public-private partnership to create a unified database management system. They also pointed out certain smart city advantages. Smart cities might boost economic growth by reducing waste and expanding access to services. Smart cities, they said, may increase residents' quality of life by lowering pollution and promoting public safety via more efficient municipal services. Furthermore, they argued that smart cities might improve social inclusion by allowing previously excluded groups to access services and resources more easily. Ismagilova et al. (2019) also noted the possible problems that must be solved to realize a successful smart city. They proposed that a broad strategy that encourages creativity,

adaptability, and versatility should direct the growth of smart cities. A substantial investment in technology, infrastructure, and human resources was also proposed to deploy smart cities successfully. Additionally, they stressed the need for stakeholder cooperation, arguing that it is crucial to achieving smart city goals.

2.3 Public-Private Partnerships

PPPs are contractual collaborations between governmental and private actors with mutually exclusive benefits where both parties pool resources, skills, and risk management to implement a project (Hodge & Greve, 2017). PPPs provide a broad avenue for financing and implementation of projects that meet social, environmental, and economic needs sustainably (Sergi et al., 2019). Outdated procurement procedures have led to increased adoption of PPPs in infrastructural development, public health, administration, environmental and ecosystem protection, tourism, water, sewage, and education, among others (Wang et al., 2017). The study by Hodge & Greve (2017) examines the performance of PPPs from a theoretical perspective. They suggest that PPPs are an attractive arrangement for governments due to their potential to reduce public expenditure, increase efficiency and improve the delivery of public services. However, they also identified a number of potential risks associated with PPPs, such as the risk of cost overruns and delays and reduced public control over service delivery. They suggest that careful consideration of the costs and benefits of PPPs should be undertaken before embarking on them.

Hodge & Greve's (2017) study emphasizes the significance of proper governance structures and laws in ensuring the success of PPPs. It is recommended that government agencies provide that PPPs are set up in a manner that makes the most of opportunities while limiting downsides. They also imply that public sector enterprises should weigh the benefits

and drawbacks of PPPs carefully before committing to one. In addition, there is a need for thorough PPP assessment and monitoring (Hodge & Greve, 2017). They advocate for government agencies to assess PPPs regularly to ensure that all are being realized. In addition, they support public sector enterprises to have plans to guarantee that PPPs are renegotiated as appropriate. The possibility of conflicts of interest between governmental and private partners in PPPs is another issue that public sector organizations should be aware of, according to Hodge & Greve (2017). They advocate for public institutions to have transparent protocols for identifying and handling conflicts of interest. Lastly, they advise public sector organizations to be wary of PPPs as a means of privatization and to work to ensure that PPPs are organized to maintain public oversight and management of service provision.

In order to fund the creation of sustainable initiatives, Sergi et al. (2019) argue that PPPs may facilitate the acquisition of resources, including money, tools, and knowledge. Their main argument is that including the private sector in the project decreases the possibility of failure. The private sector's service administration and delivery expertise is another way PPPs may boost public service quality. For instance, PPPs may be utilized to enhance the supply of healthcare services, including the distribution of medical supplies and the administration of healthcare infrastructure. Furthermore, PPPs may encourage creativity and speed up the introduction of advanced products and services. For instance, public-private blocks may be utilized to finance R&D initiatives, leading to innovative new goods and services. In addition, PPPs may be used to increase information and expertise exchange between the private and governmental sectors, which in turn can contribute to better public services (Sergi et al., 2019). Yet, PPPs are not without their fair share of potential dangers. For instance, the public sector partner may be unable to fulfill its financial commitments,

while the private sector partner may fail to provide the desired results. It is also possible that the project will not be profitable or will not address public-sector priorities. Hence, governments should weigh the pros and downsides of PPPs thoroughly before committing to one. For PPPs to succeed, strong governance structures and rules must be established. For instance, governments should ensure that PPPs are subject to sufficient monitoring to guarantee that they provide the desired results. In addition, governments should ensure that the PPP's terms are well-defined and that all parties engaged are accountable for their behavior. Lastly, governments should thoroughly monitor and assess PPPs to guarantee that they are serving the public interest.

PPPs have been proposed by Wang et al. (2017) as a means to both increase efficiency in the provision of governmental services and decrease their associated costs. For instance, they may lessen the likelihood of project failure by dividing responsibilities between the private and governmental sectors. They also provide the public sector access to knowledge and technology otherwise unavailable. They may also be used to entice the private sector to fund public infrastructure projects, which have the dual benefit of increasing economic development while decreasing government spending. However, they imply that PPPs should be meticulously planned and governed to guarantee their success. For instance, they contend that proper monitoring is essential to avoid the public sector being subjected to undue risks and to strike a balance between public and private sector interests. They also recommend that PPPs be governed by explicit laws so that everyone involved may be held accountable and everyone benefits. PPPs can only be successful if they have strong governance mechanisms, according to Wang et al. (2017). They argue that government agencies need to be able to evaluate the costs and advantages of a project and have a firm

grasp on the risks inherent in PPPs. To guarantee that PPPs continue to be successful and provide the anticipated benefits, they also recommend that governments establish defined mechanisms for monitoring and reviewing them. Lastly, they advocate for the government's ability to renegotiate PPPs if the situation demands it.

Xiong et al. (2019) review the research on PPP governance. They propose that public sector organizations have a comprehensive grasp of the risks and benefits associated with PPPs and address the significance of appropriate monitoring and laws to guarantee the success of PPPs. They draw attention to the need for careful monitoring and assessment of PPPs. Bayliss & Van Waeyenberge (2018) conduct a thorough literature evaluation of PPPs. They highlight many concerns that might arise from PPPs, notwithstanding their potential benefits to the public sector regarding cost savings and enhanced service delivery. They argue that governments should weigh the pros and downs before committing to PPPs. An overview of the research on PPPs in infrastructure projects is provided by Cui et al. (2018). The authors list the advantages of PPPs and examine the problems that may arise from using them. They imply that PPPs must be meticulously planned and supervised to achieve their full benefits. Carbonara and Pellegrino (2020) investigate the impact of PPPs on developing new ideas. PPPs may improve collaboration between government and business, which in turn helps speed up innovation in both areas. To guarantee the success of PPPs, they also emphasize the need for efficient risk management and monitoring. Sarmento & Renneboog (2021) conduct a literature assessment on PPP renegotiation. They point out the dangers of renegotiation and advise that governments weigh the pros and cons of the move carefully before deciding whether or not to renegotiate PPPs. As a result, they recommend that institutions in the public sector have well-defined plans for handling the transition to the new agreement.

Lima et al. (2021) review the literature on PPPs in the water sector. They list various advantages PPPs may have in the water industry, such as better service delivery, cheaper costs, more opportunities for innovation, and less financial strain on the government. Water service efficiency is one area where private finance and technology may be leveraged via PPPs. Moreover, they imply that PPPs might be used to lessen the financial burden of delivering water services while raising the bar for service quality. Lima et al. (2021) argue that PPPs may be leveraged to boost innovation in the water industry. Partnerships for PPPs may open the door to the knowledge and resources of the private sector, paving the way for the creation of innovative products and methods. As a result, this has the potential to both lower the cost of delivering water services and increase the quality of those services. The private and governmental sectors may pool their resources and knowledge with the help of PPPs. The water sector PPPs identified by Lima et al. (2021) are not without their share of possible dangers. Overrun costs, a lack of clarity, insufficient monitoring and assessment, and possible bias are all potential issues. They also imply that PPPs are not always the most economical means of delivering water services. Despite the dangers involved, PPPs may be advantageous for the water industry, according to Lima et al. (2021). They imply that PPPs must be meticulously planned and supervised to achieve their full advantages. They stress the need for strict laws and strong monitoring for PPPs to be successful. Moreover, they recommend that government agencies weigh the benefits and drawbacks of PPPs before committing to them.

2.4 PPPs in Smart Cities and Innovation

Public participation, politics, governance, legal, management, and administrative procedures are key players in developing complex and resilient collaborations between the private and

governmental sectors in smart city projects (Selim et al., 2018). Private consulting companies provide a variety of services supported by a resilient organization structure, availability of capital, resources, expertise as well as cutting-edge technology, which many governments suffer from budget deficits and debt, thus promoting the use of PPPs in implementing city projects (Liu et al., 2020). In digital city projects, PPPs bridge the gap in building materials, technologies, labor productivity, funding, and technical expertise (Sergi et al., 2019). Digital cities are usually developed by collaborating with universities, citizens, consumers, entrepreneurs, industries, and other public and private sector players (Appio et al., 2019). The capacity of smart city innovation in local and national governments is limited due to limited resources, governance powers, and low capabilities, which requires the addition of private businesses to ensure the right economic environment is achieved (Taylor Buck & While, 2017).

According to Komninos et al. (2013)'s research, PPPs are crucial for creating and carrying out Smart City initiatives because they make pooling resources, information, and skills easier. The authors also point out that PPPs may aid in overcoming the financing and talent gaps that often impede Smart City efforts. Cheng et al. (2023) examined the efficiency of PPPs in fostering innovation in Smart Cities. The researchers discovered that PPPs might increase cities' potential for innovation by giving them access to private sector resources and experience. PPPs, they said, may aid in addressing the difficulties of fragmentation and coordination in creating Smart City initiatives. Liu et al. (2018) reviewed PPPs in smart cities and found various advantages, including better public services, faster economic development, and higher citizen engagement. The authors point out that PPPs may be especially useful in tackling the financial and implementation issues that often impede Smart City initiatives.

PPPs in the context of smart cities and innovation are rapidly developing. Smart Cities are defined as cities that use digital technology to collect data and use it to improve services, infrastructure, and governance (Liu et al., 2021). Data made possible by modern technology is used to create novel approaches and enhance the standard of living for the general public. Public institutions can't always afford to do this independently; therefore, PPPs are frequently necessary. Knowing the many forms of PPP initiatives may take is a prerequisite to comprehending their part in Smart Cities and Innovation. Partnerships that focus on providing services, building infrastructure, or delivering public goods fall under this category, according to Liu et al. (2021). In addition to highlighting the necessity for strong leadership, good communication, and a common goal when forming a PPP, the authors also highlight the need to understand all stakeholders' motives. This is particularly true when the public and commercial sectors have divergent aims. Using Hong Kong as their case study, Lam & Yang (2020) investigate what criteria prompt local governments to consider PPPs for digital city initiatives. The authors polled public servants and businesspeople to get their thoughts on PPPs in this setting. The findings revealed that stakeholders took into account not just the risks and costs associated with PPPs but also their potential advantages, such as better efficiency, more creative solutions, and enhanced service delivery. Hybrid alliances are discussed by Ferraris et al. (2018) about open innovation initiatives that pool public and private sector resources and expertise to create novel solutions. According to the authors, this teamwork is essential for Smart Cities to fulfill their full potential. They also note that robust communication and coordination are crucial for successful projects. An effective PPP should establish an atmosphere where all stakeholders are encouraged to cooperate and develop.

PPPs have potential advantages, but they also have shortcomings, and several things may affect how well they work. According to research by Pinz et al. (2018), PPPs may be difficult to implement due to variances in organizational cultures, power dynamics, and conflicting interests. The authors pointed out that creating and sustaining successful collaborations between the public and commercial sectors sometimes requires a large commitment of time and money. PPPs may also provide substantial challenges regarding contract negotiation and agreement, risk distribution, and profit and loss sharing. Also, the engagement of several stakeholders in PPPs might result in conflicting agendas that can halt development. Effective coordination, communication, and stakeholder cooperation are essential for overcoming these obstacles (Pinz et al., 2018). PPPs need clear and transparent governance systems to control conflicts of interest, guarantee adherence to relevant laws and standards and track performance. PPPs might be more likely to result in more innovation and better services.

2.5 Review of Existing Literature

Almarri (2022) investigates the value-for-money aspects and how they relate to PPP initiatives for smart cities. The author argues that PPPs are an important part of digital city development, as they can help to reduce costs, optimize resource allocation, and provide access to new technologies. According to the author, PPPs can also help to reduce risk, as private partners are able to share the risk of a project with the public sector. Furthermore, PPPs can provide access to innovative ideas and resources, which can facilitate the development of smart cities. The author also suggests that the success of a PPP project depends on its ability to achieve a balance between value for money, risk sharing, and project sustainability. The author cites several examples to support his argument. For instance, he

discusses the case of the Abu Dhabi Airport PPP project, where the private and governmental sectors collaborated to reduce costs and increase efficiency. He also mentions the Medellin Metro PPP project in Colombia, which successfully used PPPs to provide access to new technologies and resources. In both cases, the authors argue that the successful use of PPPs enabled the projects to achieve their desired objectives.

Lam & Yang's (2020) investigation of the variables affecting Hong Kong's consideration of PPP for digital city projects. The authors found that the most important factors included the need to reduce costs and improve service delivery, the availability of government funding, and the potential for creating new business opportunities. They also highlighted the benefits of PPPs in developing new technologies and services and providing financial support for digital city projects. For instance, PPPs may facilitate access to capital for digital city projects, which can help reduce costs and improve project delivery efficiency. Additionally, PPPs are seen as an effective way to access new technology and services that would otherwise be unavailable and create new business opportunities. Furthermore, PPPs can help to ensure that projects are properly planned and managed, which helps reduce the risk of failure or delays. Lam & Yang (2020) also noted that PPPs could help to create a more equitable and sustainable digital city environment. This can be achieved by focusing on the local community's needs and involving citizens in the decision-making process. Additionally, PPPs can bring together public and private actors to collaborate on projects, which can help to ensure that projects are properly planned and managed. Moreover, PPPs can help to create an environment of trust and collaboration, which can be beneficial in the long run. Finally, Lam & Yang (2020) suggest that PPPs should be carefully evaluated to ensure they benefit the private and governmental sectors. This can include assessing the potential for cost

savings, the potential for new business opportunities, and the potential for developing new technologies and services. Furthermore, it is important to assess the potential for risk sharing and project sustainability and the potential for creating an environment of trust and collaboration between governmental and private actors. It is also important to consider the possibility of PPPs to create a more equitable and sustainable smart city environment.

The dynamics of smart cities are evaluated by Appio et al. (2019), who consider factors including innovation ecosystems, technical progress, and social issues. As PPPs may increase access to new technology, provide new business possibilities, and better deliver services, they have the potential to boost the innovation ecosystems of smart cities. For instance, PPPs provide governments access to new technology and services that would otherwise be out of reach, enabling more efficient and successful smart city project development. In addition, PPPs may allow private sector players to grow their businesses by supplying goods, services, or technical solutions to public sector organizations. PPPs enable the private and governmental sectors to share resources and risks, lowering the overall project costs. PPPs are crucial for increasing the effectiveness of smart city initiatives, according to Appio et al. (2019). By partnering with the private sector, the government has access to their knowledge and resources, helping them to create more efficient and cost-effective initiatives. For instance, PPPs may guarantee that the correct assets and expertise are accessible at the proper time and cost. This may ensure that the project is completed on schedule and within budget while decreasing the likelihood of failure. After everything is said and done, Appio et al. (2019) argue that PPPs may facilitate a more cooperative atmosphere between public and private players. Collaboration between the public and commercial sectors allows for the creation of novel approaches to resolving pressing issues, such as the need to enhance the

quality of service delivery while simultaneously lowering associated costs. When both the private and governmental sectors have a vested interest in a project's outcome, a mutual feeling of trust is more likely to develop. Each party gains from this arrangement if the project is finished on time and within budget.

Quan & Solheim (2023) present a critical survey of PPPs in smart cities and suggest a research agenda. The authors argue that PPPs may help smart cities by lowering costs, speeding up service provision, and increasing access to cutting-edge technology. However, they stress the importance of PPPs' capacity to foster mutual trust and cooperation between government and business. For instance, the authors emphasize the need for open and honest dialogue among all parties involved and establish a common understanding of the partnership's overarching goals in their study. In light of this, Quan & Solheim (2023) argue that cooperation is crucial for effectively implementing PPPs and smart city objectives. Moreover, the authors stress the need for governments to know the benefits and drawbacks of PPPs and create suitable frameworks for their implementation. They advise governments to consider the necessity for regulation and monitoring, as well as the costs and risks of PPPs. Additionally, the authors stress the need to evaluate the private sector's capability of delivering the required objectives and the possibility of generating new economic prospects. To foster stakeholder trust and cooperation, Quan & Solheim (2023) argue that governments should work to ensure that public and private sector interests are aligned. They also emphasize the need for governments to establish structures encouraging communication and mutual understanding between the private and governmental sectors. PPPs have the potential to generate new economic and social value, according to the authors.

Many practitioner-led studies supplement the existing academic literature on the impact of PPPs on digital city efforts. An example of such a study is a recent report from the World Bank (2020) that presented an overview of the usage of PPPs in smart cities in Latin America. Although praising PPPs for their potential to spur innovation and boost economic development, the research also emphasized their shortcomings, such as insufficient public sector capability, distrust between the private and governmental sectors, and the need for strong governance mechanisms. Although PPPs represent a promising approach to realizing digital city goals, the authors caution that organizations must be prepared to overcome the obstacles inherent in their implementation. The impact of PPPs in smart city programs has been the subject of several practitioner-led research. Increased access to resources and technology, improved efficiency in the delivery of public services, and the possibility for economic growth are just some of the benefits of PPPs that have been highlighted, for example, in a report by the European Investment Bank (2022). Nevertheless, the paper also highlighted some of the difficulties that might arise from PPPs, such as the possibility of market failure, the need for appropriate governance structures, and conflicts of interest. The authors believe that PPPs may play a significant part in digital city programs, but the difficulties of implementing them must be overcome before this can happen.

Similarly, a report by the United Nations (2019) examined the role of PPPs in advancing smart city initiatives. The authors identified several opportunities, such as the potential to access new technologies and generate new revenue streams, as well as the ability to leverage resources and expertise across sectors. Nevertheless, they also highlighted the difficulties of PPPs, such as a lack of confidence between the private and governmental sectors, insufficient public sector capability, and a failure to keep up with technological

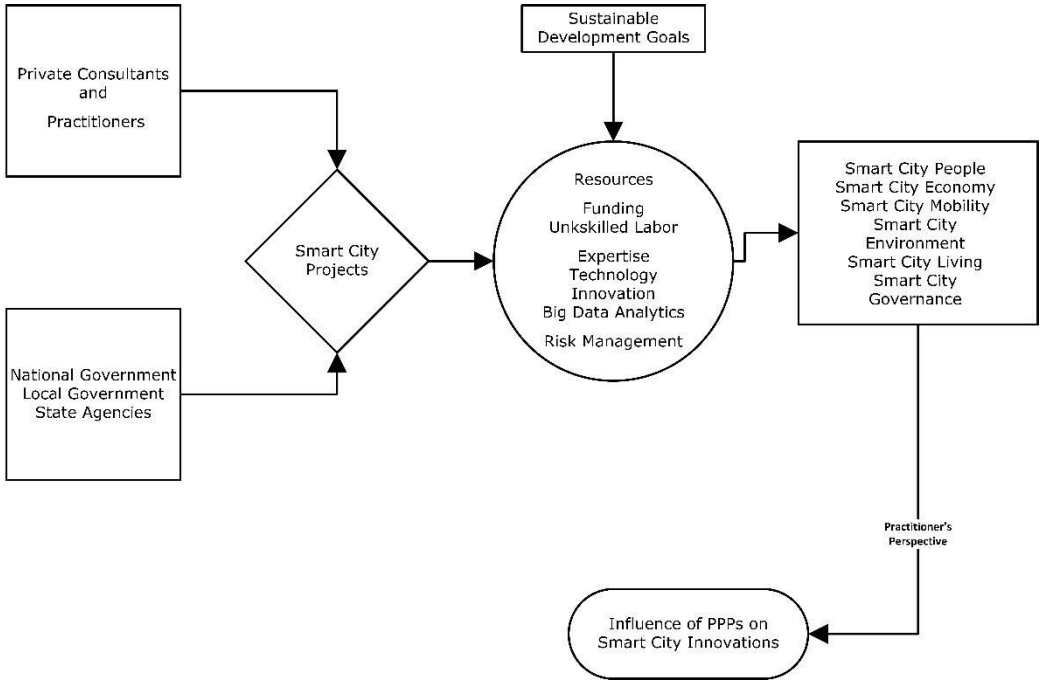
developments. The study's authors stated that PPPs provide promise as a strategy for realizing digital city goals but cautioned that organizations should be prepared for the difficulties inherent in implementing such a plan. Lastly, a European Commission research (2019) looked at PPPs in smart cities throughout Europe. Possibilities for economic development and access to more resources are only two of the many advantages the writers highlight while discussing PPPs. Many difficulties were also highlighted, including a lack of public-private trust, the possibility of bias, and a shortage of government resources. Although PPPs represent a promising approach to realizing smart city goals, the authors caution that organizations must be prepared to overcome the obstacles inherent in their implementation.

2.6 Conceptual Framework

A review of existing literature on the topic was used to develop a conceptual model that was used to carry out this study. The conceptual model is proposed as shown in Figure 1 below.

Figure 1

Conceptual Framework



The conceptual framework proposed for this study aims to assess the influence of PPPs on Digital city innovations from a practitioner's perspective. This framework explains how the different actors, including private consultants and practitioners, national and local governments, and state agencies, influence the implementation of Smart City projects. Additionally, the framework takes into consideration the impact of the Sustainable Development Goals and the resources, funding, unskilled labor, risk management, expertise, technology, and innovative big data analytics needed for successful Smart City projects. The framework also explains how the successful implementation of Smart City projects can influence the "Smart City people, Smart City economy, Smart City mobility, Smart City environment, Smart City living, and Smart City governance." This framework is based on existing literature and provides the basis for the study. The proposed framework will help to identify the main factors that influence the successful implementation of Smart City projects and the benefits that can be expected from them. The framework will also provide an

understanding of how PPPs can contribute to the development of Smart City innovations and the impact of PPPs on the different aspects of Smart City living.

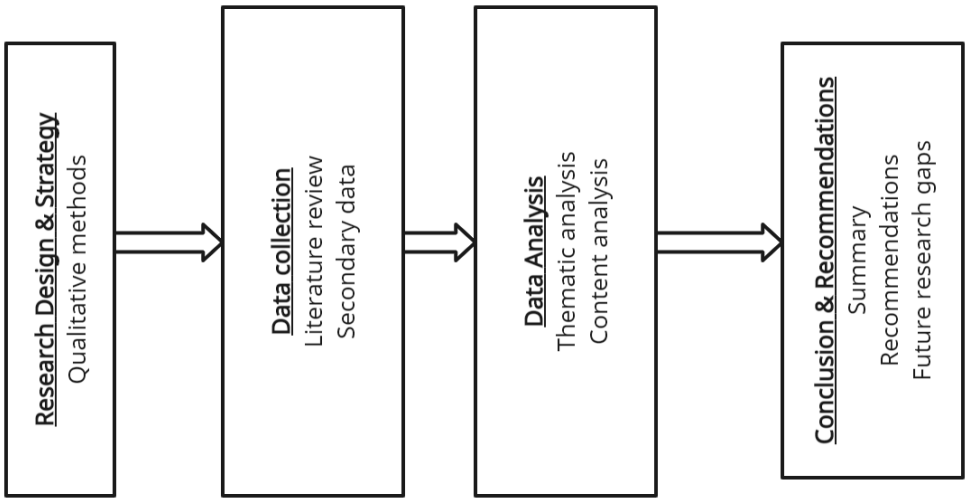
When evaluating the impact of PPPs on Smart City innovations, this framework will provide a birds-eye perspective of all the aspects that must be considered. As a result, professionals may have a deeper appreciation for the value of PPPs in creating Smart City initiatives. The framework will also shed light on the many players who bring Smart City initiatives to fruition and the means, knowledge, and capital required to do so. As a result, professionals will be better equipped to assess Smart City initiatives for their prospective returns and to make informed decisions about how they might best aid in the evolution of Smart City technologies. In addition, the framework will aid professionals in evaluating PPPs' effects on the many facets of life in Smart Cities and determining where and how they might be used to enhance residents' quality of life in these areas.

Chapter 3.0. Methodology

This section will outline the research design, data collection methods, instruments, research strategy, and data analysis methods utilized in this study. It will also constitute ethical considerations of the study as well as the limitations and delimitations of this research topic, as shown in the Figure below.

Figure 2

Methodology Framework



3.1 Research Design

The research design used in this study involved a qualitative research method. Qualitative research effectively examines complicated and nuanced phenomena by focusing on the individual participants' subjective experiences and views (Rahman, 2020). This enabled the researcher to study the opinions and experiences of multiple stakeholders engaged in such collaborations, which led to a greater knowledge of the PPPs in digital city developments. Qualitative research allows for a flexible and open-ended approach, which may provide rich and in-depth data. However, as it takes a lot of effort to gather and evaluate

data, this method might have the drawback of being time- and resource-intensive. Some of these restrictions in this research were circumvented through secondary data. The time and money necessary for data gathering were decreased by using secondary data sources, such as reports and publications, to gain information on the subject. Additionally, since it allowed for the participation of many stakeholders, employing secondary data ensured that a diverse variety of opinions were represented. As the researcher's interpretation of the data may be impacted by their own opinions and experiences, bias is another possible drawback of qualitative research. (Johnson et al., 2020). However, this was solved using many data sources and data analysis techniques, which helped guarantee that the results were valid and consistent. Triangulation was also utilized to guarantee that several sources of information backed up the conclusions.

3.2 Research Strategy

The research strategy involved extracting data from secondary sources, such as articles, books, and working papers, to analyze the influence of PPPs in digital city innovations from a practitioner's perspective. The research strategy outlined above utilizes secondary data sources to investigate the influence of PPPs in digital city innovations from a practitioner's perspective. This strategy offers several benefits. First, it makes it possible to examine diverse facts and opinions on the matter, which could result in a deeper understanding of the issue. Secondary data sources include reports, articles, books, studies, conference proceedings, and working papers. All of these may help one have a better understanding of the topic. Secondary data sources provide the researcher with a variety of knowledge that may not be as readily available via primary data collection methods like interviews or surveys (O. Nyumba et al., 2018). This suggests that the researcher may obtain

data from a more diverse range of sources, which might result in a greater understanding of the issue. A researcher may save time and work using secondary data sources since they have often already been processed. Comprehending the present knowledge level on a subject and recognizing gaps in existing research is another benefit of utilizing secondary data sources (Ruggiano & Perry, 2019). The researcher may pinpoint areas that need further study and provide suggestions for future research by evaluating the literature on the subject. This may contribute to advancing knowledge on the subject and creating technologies for smart cities.

Additionally, employing secondary data sources may help provide the issue with a more impartial viewpoint. This is so that the researcher may avoid biases created by primary data gathering techniques as the data has already been gathered and processed by others. The researcher may also contrast and compare information from other sources, which can aid in spotting contradictions or inconsistencies in the data. Finally, it may be economical and useful to use secondary data sources. Because the researcher must choose and contact possible participants, arrange interviews or surveys, then evaluate the results, gathering primary data via interviews or surveys may be time-consuming and costly (Jain, 2021). In contrast, secondary data sources are often accessible and simple to obtain, saving the researcher's time and resources. In summary, using secondary data sources in this research technique has several benefits, including access to a broad variety of material, a more thorough grasp of the subject, the ability to spot gaps in existing knowledge, an unbiased viewpoint, and cost-effectiveness. An approach is a good option for examining the role of PPPs in digital city developments from a practitioner's viewpoint because of these benefits.

3.3 Data Analysis

The data analysis section identified the study strategy, methodologies, and techniques utilized to decode and evaluate the secondary data obtained. The data was broken down, organized into themes, and examined for linkages with the study subject using a qualitative research methodology, content analysis, and thematic analysis techniques. This approach is often employed in social science research, where the goal is to better understand complicated processes by studying text data. Data analysis using content analysis is methodical, objective, and quantitative (Neuendorf, 2018). By quantifying the frequency of certain words or phrases in the data, patterns, and themes may be found in the data. After that, the researcher examines the frequencies to find patterns and discrepancies in the data. Thematic analysis, on the other hand, is a technique for finding themes in data by methodically classifying and organizing the information into significant ideas or themes. The themes are then analyzed to draw conclusions about the research question. The researcher used these methods to identify key themes and patterns in the data related to the six key aspects of smart cities. These aspects include governance, economy, environment, mobility, living, and people. The data was organized and sorted into categories based on the research questions, and the findings were cross-checked and validated to ensure the credibility of the research. The researcher also examined the relationships between the data and the research topic to identify the various impacts of PPPs on digital city innovations.

The study was generally suited for using a qualitative research design, content analysis, and theme analysis techniques. These techniques enabled the researcher to formulate conclusions regarding the study topic, identify major themes and patterns, and conduct an organized and impartial data analysis. The study results' the employment of these

techniques further increased credibility. But it is important to remember that this approach has significant drawbacks. For instance, the results could not be transferable to other situations, and the researcher's interpretation of the data can be subjective. The analysis and interpretation of the data may be impacted by the researcher's prejudices and assumptions (Johnson et al., 2020). Researchers must be aware of these constraints to minimize their negative effects on the study results.

3.4 Ethical considerations

Various ethical factors have been taken into account while performing this study. Fairness and impartiality are among them. To preserve objectivity and the validity of the results, the researcher has ensured that the data gathering and analysis processes are free from bias. This is an important factor to consider since bias might impact the reliability and validity of the findings, which in turn can undermine the study's credibility. Confidentiality and anonymity are two additional ethical considerations that have been considered. The obtained secondary data will be kept private, and any identifying information will be omitted to preserve the privacy of secondary sources. This is crucial to guarantee that no damage comes to people or groups that the study could impact. Data accuracy and reliability are other critical ethical consideration that has been considered (Braun & Clarke, 2022). The researcher has taken careful measures to ensure that the secondary data collected is accurate and credible. The data will be cross-examined with existing literature and sources to verify findings. This ensures the results are trustworthy and the research can inform policy and decision-making.

However, there are limitations to the use of secondary data. For instance, the researcher has no influence over the data quality because it may have been gathered for a

different purpose. The analyst may likewise confront difficulties getting to information, especially when the information is restrictive or delicate. This may limit the generalizability of the findings and affect their accuracy and dependability. The potential impact of the research on the participants or stakeholders is another ethical consideration that has been considered (Suri, 2020). To guarantee that participants are not harmed, or maybe distressed by the study, safety measures have been taken by the researcher. Participants or stakeholders are unlikely to be directly influenced by the study since it is based on secondary data. However, the researcher must still be conscious of the study's possible consequences and ensure the data are presented honestly and properly. So, to ensure that the research is conducted ethically and responsibly, this study's ethical concerns are essential. Factors to consider include fairness and impartiality, confidentiality and anonymity, data accuracy and dependability, and the research's possible impact on participants or stakeholders. Despite the limits of secondary data, the researcher has taken precautions to guarantee that the results are trustworthy and may be used to guide policy and decision-making. If these ethical factors are considered, the study may be conducted responsibly and ethically, contributing to the development of knowledge in the subject.

3.5 Limitations and Delimitations

Any research study must take constraints and delimitations into account as key elements. One drawback of this research is the short time that secondary data could be gathered. The researcher decided to solely gather information from current sources, which may have limited the results from earlier sources. This suggests that the data may not entirely represent the study subject, which is a serious restriction. This restriction is especially important for research that depends on old data or data accumulated over time. The research

design and approach are yet another constraint impacting this study. The researcher conducted their study using secondary data-gathering and qualitative research methodologies. Due to their reliance on the interpretation of data, qualitative research techniques are well-acknowledged to be biased and error-prone (Fox et al., 2022). As a result, the study's conclusions could not be impartial, and its integrity might be called into doubt. Furthermore, secondary data could have been gathered for a different reason, which might have impacted the reliability and accuracy of the results. The study's generalizability and validity may be significantly impacted by the study's timing and research design limitations. The study's conclusions could not be broadly applicable if the researcher could not gather data representative of the whole research issue. Furthermore, it may be challenging to demonstrate the validity of the study's conclusions due to the possibility of bias and mistakes in the data-gathering procedure.

The other limitation was the scope of the study, which only focused on the practitioners' perspectives and excluded other stakeholders, such as the public sector and citizens. This limitation may have restricted the research's overall understanding of the PPPs' impact on digital city projects. While the practitioners' perspective is undoubtedly crucial, the lack of input from other stakeholders may have skewed the study's results. For example, public sector representatives may have different opinions and insights on PPPs' effectiveness than practitioners. Citizens, on the other hand, could provide valuable feedback on how PPPs impact their daily lives and the services they receive. Thus, by excluding these groups, the study may have missed important perspectives that could have enhanced the research's overall validity. The last limitation and delimitation was the study's geographic bias. The fact that the study participants were situated in certain geographic areas may have prevented the

results from being broadly applied to other areas. If the research had been carried out in a location with distinctive features that were not typical of other places, this constraint may have been very troublesome. For instance, the results may not apply to less affluent or rural areas if the research concentrated on PPPs in digital city initiatives in a rich, metropolitan location. This constraint may be overcome by boosting the sample size and drawing individuals from a larger pool of places. However, this could have proved difficult due to resource shortages or time restrictions.

It is important to recognize that limitations and delimitations are typical in research projects and that researchers should be open and honest about these restrictions in their findings. Researchers may aid readers in interpreting the study's findings and determining their work's overall validity by recognizing these limitations. Remembering restrictions and delimitations might provide insightful information for the next study projects is also critical. Researchers may create future studies that address these gaps and provide a more thorough grasp of the study issue by recognizing these limitations. The researcher may have used an alternative research design and method that would have permitted the collection of data from a wider variety of sources to offset the constraints of the study. They may have, for instance, used a mixed-methods strategy that would have for the gathering of both qualitative and quantitative data. With this strategy, the researcher would have been able to gather information from various sources, including primary and secondary data, increasing the study's reliability and validity. The researcher also had the option of doing a meta-analysis to combine the findings of earlier investigations into the same subject. If they had used this strategy, they could have offered a more thorough analysis of the results and had a deeper grasp of the study issue. The researcher would have also been able to incorporate studies

from various periods, which would have addressed the restriction of just gathering data from current sources.

Chapter 4.0. Data Presentation, Analysis, and Discussion

This section will present the secondary data collected from journals and books, among other sources, findings of the research, patterns, trends, and relationships deduced from the study, as well as compare the findings with those of previous research in a clear and organized manner. The findings of the study will revolve around the roles of PPPs and innovation networks in digital city projects and innovations, detailing the opportunities and challenges facing digital city projects implemented using PPPs and the key factors that influence the success of these factors. The section will also analyze the data presented and how it contributes to meeting the objectives and answering the research questions. The study's findings will be discussed in comparison to the literature review and the objectives. Key insights drawn from the interpreted data will be reviewed and related to solving the problems the research addresses. This section will be presented in a narrative format, providing a detailed description of the findings and discussing their significance concerning the research questions and existing literature on the subject. Relevant tables and figures will accompany the data to aid in demonstrating the key findings. In summary, this section will provide a comprehensive understanding of the influence of PPPs in digital city innovations from a consultant’s perspective.

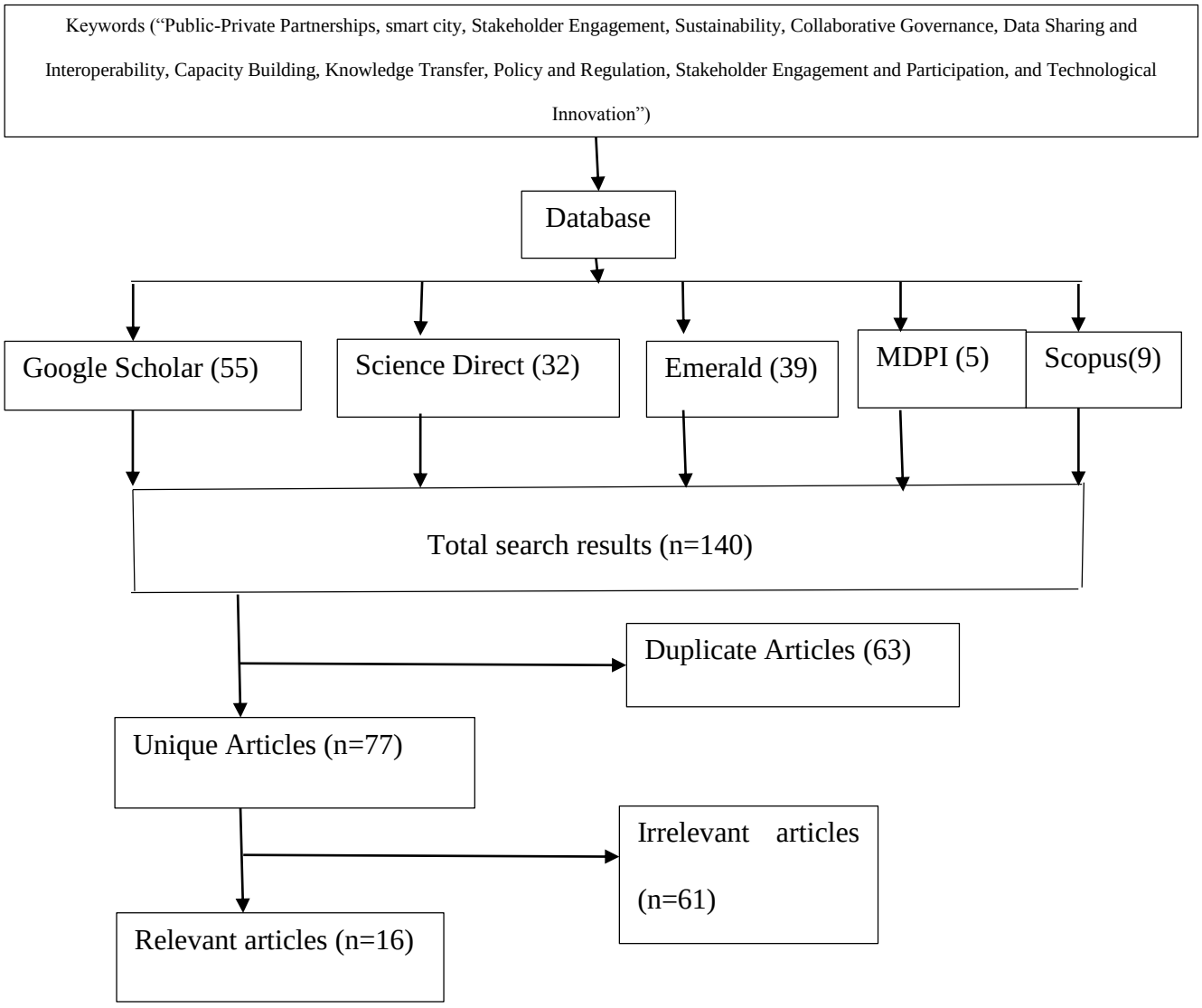
4.1 Data Presentation

This section concerns how the researchers found and selected academic articles for the study on PPPs in smart cities. The researcher started by searching 227 journal articles but found that many were irrelevant to their study. So, they refined their search criteria to get 140 academic articles published after 2018, and from those, they identified 77 unique academic articles after removing duplicates. They then screened all the unique studies for relevance and

ended up with 53 relevant articles. From these 53 articles, the researcher found that 16 empirical studies focused on the process of PPP in smart city projects. They included these studies in their content and thematic analysis to synthesize qualitative evidence, as shown in Figure 3 below.

Figure 3

Literature Search Process



They carefully read and organized these 16 studies to compare and contrast to allow for analysis and synthesis, as shown in Table 1 below. The researcher's study aims to assess the influence of PPPs on the success, performance, and sustainability of smart city projects, identify best practices for successful collaboration between private and governmental sectors in implementing city projects, and explore the interactions between PPPs and smart city innovations and developments. They selected academic articles focusing on PPPs and smart cities to achieve these aims. The study's findings will detail the opportunities and challenges facing digital city projects implemented using PPPs, as well as the key factors that influence the success of these projects. The study will also examine emerging themes of interest in PPPs in digital city projects. The selected articles include various studies, such as empirical studies and review articles. The researcher's literature review focuses explicitly on the emerging themes of interest in PPPs in digital city projects. The researcher hopes to identify patterns and themes across states that will help in digital city research and practice by examining these studies. Generally, the researcher used a systematic process to select relevant academic articles for their study on PPPs in smart cities. The researcher screened many articles and selected the ones that would be most useful in achieving their research objectives.

Table 1

Summary of Selected Studies

Number	In-text citations	Location	Methods	Purpose
1.	Selim et al. (2018)	Not specified	Literature review and case studies	To investigate how PPPs might help smart infrastructure projects achieve sustainable development

2.	Liu et al. (2021)	Not specified	Literature review and conceptual framework	To identify emerging PPP application concepts for creating smart city projects
3.	Selim & ElGohary (2020)	Not specified	Case studies and survey	To research how stakeholders play a role in PPPs for smart infrastructure projects
4.	Lam & Yang (2020)	Hong Kong	Case studies and survey	To investigate the elements affecting the use of PPPs for smart city projects
5.	Sergi et al. (2019)	Russia	Econometric analysis	To evaluate the effect of smart city development on Russian economic growth
6.	Hoeft et al. (2021)	Not specified	Case studies and literature review	To investigate the use of robotics and automation in PPP projects for infrastructure life cycle sustainability
7.	Mora et al. (2019)	European cities	Multiple case study analysis	To create strategic guiding principles and best practices for the development of smart cities
8.	Fernandez-Anez et al. (2018)	Vienna, Austria	Conceptual model analysis	To study smart city development implementation and discussions and provide a comprehensive model
9.	Lai et al. (2020)	Not specified	Review of technical standards	To review technical standards for smart city development
10.	Nguyen et al. (2019)	China	Implementation analysis	To examine how a certain urban water management system is being implemented

11.	Zekić-Sušac et al. (2021)	Not specified	Machine learning-based system analysis	To suggest a machine learning-based approach for controlling the public sector's energy efficiency in order to construct smart cities
12.	Irazábal & Jirón (2021)	Latin America	Qualitative analysis of policy documents and interviews with stakeholders	To examine the tension between global smart city discourses and local contexts in Latin America
13.	Li et al. (2022)	International (Delphi study)	Expert panel survey and analysis	To identify factors driving policy transfer in smart city development
14.	Keymolen & Voorwinden (2020)	International (focus on Netherlands)	Qualitative analysis of policy documents and interviews with stakeholders	To investigate the part that trust and the rule of law play in the creation of smart cities and PPPs
15.	Voorwinden (2021)	International (focus on Netherlands)	Qualitative analysis of policy documents and interviews with stakeholders	To explore the privatization of urban governance in the context of smart city development and PPPs
16.	Desdemoustier et al. (2019)	Belgium	Case studies and interviews with local actors	To understand how local actors appropriate and use smart city technologies

Note: "Not specified" in the "Location" column means that the study did not focus on a specific geographical location.

4. 2 Analysis

An in-depth content and thematic analysis were conducted on the 16 empirical studies identified in the literature search (see overview in Table 1). Three key themes emerged from

the literature search on PPPs and smart city projects, answering each research question as summarized in table 2 below.

Table 2

Summary of Themes

Objective	Theme 1	Theme 2	Theme 3
Assessing the influence of PPPs on smart city projects	Sustainability	Stakeholder roles	Benefits and Challenges of PPPs
Identifying best practices for public-private collaboration	Collaborative Governance	Data Sharing and Interoperability	Capacity Building and Knowledge Transfer
Exploring interactions between PPPs and smart city innovations	Policy and Regulation	Stakeholder Engagement and Participation	Technological Innovation

To assess the influence of PPPs on the success, performance, and sustainability of smart city projects

Benefits and Challenges of PPPs

PPPs are becoming a more popular option for the execution of smart city initiatives. PPPs are characterized as lengthy contractual agreements between public and private parties where risks, obligations, and resources are pooled to accomplish the same goal. In smart city initiatives, PPPs seek to use the private sector's resources, know-how, and creativity to create sustainable, effective, and efficient urban infrastructure. However, PPP implementation in smart city initiatives offers advantages and difficulties that should be properly evaluated. Access to private sector resources is one of the main advantages of PPPs. Selim et al. (2018) contend that PPPs provide the public sector access to resources from the private sector, such as capital, technology, and knowledge. This may make smart city initiatives easier to execute,

especially when they call for substantial infrastructural and technological expenditures. According to Liu et al. (2021), PPPs can bring together various stakeholders with complementary skills and resources to create creative and long-lasting solutions. By allowing the private and governmental sectors to share risks and duties, PPPs may help ease the strain on public resources. Innovation is another advantage of PPPs. According to Selim & ElGohary (2020), PPPs may promote innovation by fusing the managerial and technical know-how of the private sector with the legal and administrative infrastructure of the public sector. This may lead to the creation of novel solutions specifically suited to the demands and difficulties smart cities face. Furthermore, according to Hoeft et al. (2021), using automation and robots in PPP projects may improve sustainability by decreasing waste and boosting efficiency.

However, there are additional difficulties that should be carefully addressed when using PPPs in smart city initiatives. Accountability is one of the key problems. According to Lam & Yang (2020), PPPs may make creating clear lines of accountability difficult since they can cause a dispersion of responsibility between the private and governmental sectors. Consequently, the public sector may be held accountable for mistakes beyond its control, harming its brand and provoking political reaction. It is crucial to develop clear governance processes and performance metrics to ensure that everyone is held responsible for their various tasks and obligations. Risk allocation is another difficulty. According to Sergi et al. (2019), the long-term nature of contractual agreements, the unpredictability of future events, and the possibility of disputes between the private and governmental sectors make PPPs complicated and dangerous. To ensure that each party is in charge of the risks it is most suited to handle, risks and responsibilities should be assigned with great care. To ensure that

the advantages of PPPs exceed the disadvantages, including transaction costs, financing expenses, and operating costs, it is also important to carefully evaluate how cost-effective they are.

Stakeholder Engagement

The effectiveness of PPPs in smart city initiatives depends on the involvement of stakeholders. According to Selim et al. (2018), successful stakeholder cooperation and communication between government organizations, business partners, and citizens is crucial for project success. According to the research, stakeholder involvement is important for determining the requirements and objectives of various stakeholders and implementing those needs and priorities into the project's design and execution. Stakeholder involvement also fosters a feeling of shared ownership and transparency among stakeholders, all essential for a project's longevity. Stakeholder participation was noted by Liu et al. (2021) as one of the growing topics in the use of PPPs in creating smart city initiatives. According to the authors, the project's goals may be better matched with stakeholders' expectations and interests via stakeholder engagement, which also increases stakeholder involvement and support. The report also emphasizes how stakeholder participation makes managing disputes and lowering project failure risk possible. The crucial part that stakeholders play in the execution of PPPs in projects, including smart infrastructure, is highlighted by Selim & ElGohary (2020). The authors stress the importance of stakeholder involvement in PPP project development, good communication, and dispute resolution. The research also emphasizes how stakeholder involvement helps detect and reduce project risks by ensuring that all parties know their respective roles and responsibilities.

According to Lam & Yang (2020), stakeholder engagement is one of the factors influencing the consideration of PPPs for smart city projects. The authors emphasize that effective stakeholder engagement can increase the chances of PPP project success and ensure project sustainability. The study further highlights that stakeholder engagement helps in identifying project needs, risks, and challenges and in designing solutions that meet the stakeholders' needs. Sergi et al. (2019) highlight the importance of stakeholder engagement in achieving economic growth in smart cities. The authors stress the role that stakeholder involvement may play in fostering PPP initiatives, encouraging private-sector investment, and generating employment. The report also emphasizes the importance of stakeholder participation in fostering the credibility and trust essential for luring private-sector investment.

In their study, Hoeft et al. (2021) highlight the role of stakeholder engagement in ensuring life cycle sustainability in infrastructure projects. The authors emphasize that stakeholder engagement helps in identifying and addressing sustainability issues and in ensuring that the project design meets the stakeholders' needs and expectations. The research also emphasizes the role that stakeholder involvement plays in detecting and reducing project risks as well as in encouraging the use of automation and robots, which may increase project sustainability and efficiency. Stakeholder involvement is thus essential to the accomplishment, effectiveness, and sustainability of PPPs in smart city initiatives. The goals of the project should be in line with the interests and expectations of the stakeholders. Effective communication and cooperation among stakeholders may also assist in identifying project requirements and priorities, managing disputes, fostering trust, and ensuring project sustainability. Engaging stakeholders may aid in fostering private sector investment,

employment creation, and economic development in smart cities. Stakeholder involvement must be given top priority in the planning and execution of PPP initiatives in smart cities.

Sustainability

When using PPPs in smart city initiatives, the idea of sustainability is becoming more and more crucial. The adoption of sustainable practices is essential for the design, development, and maintenance of the infrastructure for smart cities, according to Selim et al. (2018). The authors contend that sustainable PPPs may facilitate accomplishing sustainable development objectives. This study highlighted several sustainable infrastructure options, such as energy-efficient buildings, renewable energy systems, and green transportation. Lam & Yang (2020) identified factors that influence the consideration of PPPs in smart city projects in Hong Kong. One of the factors they identified was the potential for PPPs to deliver sustainable infrastructure. The study found that sustainable infrastructure was seen as a positive factor in considering PPPs. Moreover, the authors suggested incorporating sustainability into the selection criteria for PPPs could encourage more sustainable infrastructure in smart city projects. Selim & ElGohary (2020) discussed the role of stakeholders in PPPs in smart infrastructure projects. To guarantee the delivery of sustainable infrastructure, the authors stressed the need to incorporate stakeholders in the design and execution of PPPs. According to the report, stakeholders were worried about how PPPs in smart city projects will affect the environment, social concerns, and the infrastructure's long-term economic viability.

Hoeft et al. (2021) explored the role of robotics and automation in PPP projects toward life cycle sustainability. The authors proposed that by lowering the environmental

effect of building operations and raising energy efficiency, the employment of automation and robots in smart city infrastructure projects might support sustainability. The research emphasizes how automation and robots may help with infrastructure upkeep and operation in smart cities, promoting sustainability over the long run. Sergi et al. (2019) looked at the connection between smart cities and economic development in Russia. The research determined that sustainable infrastructure was essential to draw in international investment and foster economic development in smart Russian cities. The authors contend that environmentally friendly infrastructure may facilitate resilient and sustainable economies. A conceptual framework for using PPPs in creating smart city projects was put up by Liu et al. (2021). The framework identifies several themes, including sustainability, that could influence the success of PPPs in smart city projects. The authors suggest that incorporating sustainability into the selection criteria for PPPs could lead to delivering sustainable infrastructure in smart city projects.

To identify the best practices for successful collaboration between private and governmental sectors in implementing city projects

Collaborative Governance

As the corporate and public sectors work together to undertake municipal initiatives, collaborative governance has become an essential component by defining common objectives, creating efficient communication channels, and including stakeholders, including citizens, in decision-making processes. The importance of collaborative governance in creating smart cities has been underlined in several dies. A multiple-case study examination of European best practices for the establishment of smart cities was carried out by Mora et al.

in 2019. They identified collaborative governance as a strategic principle underpinning successful smart city projects. The authors noted that effective collaboration between the private and governmental sectors is critical to ensure that smart city initiatives meet the needs of citizens and deliver tangible benefits. Fernandez-Anez et al. (2018) developed an integrated conceptual model to examine smart city implementation and discourses. For the private and governmental sectors to collaborate to achieve shared objectives, they emphasized the significance of collaborative governance. The authors pointed out that collaborative governance may increase openness, responsibility, and involvement in the decision-making processes, which can improve results for people. Lai et al. (2020) reviewed the technological requirements for smart cities. They underlined the value of cooperative governance in creating and putting into practice technical standards. The authors pointed out that including stakeholders in the standardization process may improve the relevance and usefulness of standards and guarantee that they consider various stakeholders' requirements.

Nguyen et al. (2019) examined the implementation of Sponge City, a specific urban water management approach, in China. The authors identified collaborative governance as a critical factor underpinning the successful implementation of Sponge City. They noted that collaborative governance enabled different stakeholders, including the private and governmental sectors, to work together towards common goals, and ensured that the implementation process was transparent and accountable. As a step toward smart cities, Zeki-Suac et al. (2021) created a machine learning-based system for controlling energy efficiency in the public sector. The significance of cooperative governance in the system's creation and execution was emphasized by the authors. They noted that involving different stakeholders in the system's development ensured that it addressed their needs and concerns and that the

implementation process was transparent and accountable. Therefore, effective cooperation between the private and governmental sectors in carrying out municipal initiatives depends on collaborative governance. Better results for people may be achieved by including stakeholders, setting common objectives, and creating efficient communication channels. These actions can also increase accountability, transparency, and involvement in decision-making processes. The studies under evaluation demonstrate the significance of cooperative governance in developing smart cities and recommend that it be considered a strategic element for the efficient execution of municipal initiatives.

Data Sharing and Interoperability

Collaboration between private and governmental sectors is essential for implementing successful smart city projects. One crucial factor for effective collaboration is data sharing and interoperability. The relevance of standards and protocols for data sharing and the implementation of open data policy is highlighted in the following sources. The effective execution of smart city initiatives depends on data exchange, according to an assessment of technological requirements for smart cities undertaken by Lai et al. (2020). The report underlines the need for system and technology compatibility to facilitate smooth data exchange. The authors emphasize how enacting open data laws may encourage data sharing, raise openness, and improve decision-making. Similarly, Mora et al. (2019) outlined severalategic principles for the growth of smart cities, highlighting the significance of interoperability and standards for data exchange. The authors stress the need to develop data-sharing protocols that promote information interchange across the public and commercial sectors. The research highlights how implementing open data laws may encourage trust and

collaboration between the public and commercial sectors. Fernandez-Anez et al. (2018) developed an integrated conceptual model for smart city implementation and discourse, focusing on the case of Vienna. The study emphasizes the need for data sharing and interoperability to enable collaboration between different stakeholders in implementing smart city projects. The authors highlight that establishing standards for data exchange is essential for facilitating data sharing between different systems and technologies.

In their investigation of the deployment of a particular urban water management system (Sponge City), Nguyen et al. (2019) emphasized the value of data sharing and interoperability. The authors emphasize that data sharing between the private and governmental sectors is critical for effectively managing urban water resources. They highlight the need for establishing protocols for data exchange to enable seamless communication between different stakeholders. As a step toward smart cities, Zeki-Suac et al. (2021) created a machine learning-based system for controlling energy efficiency in the public sector. The study emphasizes the need for data sharing and interoperability to enable collaboration between different stakeholders. The authors highlight that establishing standards for data exchange is crucial for seamless communication and coordination between the private and governmental sectors. Therefore, the reviewed sources highlight the importance of data sharing and interoperability for successful collaboration between private and governmental sectors in implementing city projects. Adopting open data policies and establishing standards and protocols for data exchange can promote transparency, trust, and cooperation between different stakeholders. Therefore, policymakers and city managers must prioritize data sharing and interoperability when implementing smart city projects.

Capacity Building and Knowledge Transfer

The success of collaborations between the private and governmental sectors in implementing city projects largely depends on capacity building and knowledge transfer. Based on their examination of several case studies of European best practices, Mora et al. (2019) claim that these two characteristics have emerged as fundamental principles in the establishment of smart cities. They found that effective collaboration requires stakeholder training and education, establishing partnerships and networks, and sharing best practices and lessons learned. In the case of Vienna, Fernandez-Anez et al. (2018) identified knowledge transfer as a crucial aspect of the city's smart city implementation. They emphasized the importance of involving stakeholders from different sectors and disciplines in the knowledge transfer process, which can help create a common language and understanding among them. They also highlighted the role of city leaders in facilitating knowledge transfer by providing resources, platforms, and incentives for collaboration. Technical standards are crucial for developing smart cities because they provide a framework and a common language for collaboration among stakeholders. In their assessment of technological standards for smart cities, Lai et al. (2020) determined that knowledge transfer and capacity development are crucial for adopting these standards. To ensure stakeholders have the skills and information needed to apply the standards successfully, they advised the creation of training programs and certification systems.

Nguyen et al. (2019), in the context of urban water management, underlined the need for knowledge transfer and capacity development in implementing Sponge City, a particular urban water management method. They recognized institutional capacity and a lack of technical experience as the two biggest obstacles to implementing this strategy, and they

suggested creating training programs and joint ventures between the private and governmental sectors to overcome these problems. According to Zeki-Suac et al. (2021), machine learning may also be used to manage energy efficiency in the public sector as a strategy for smart cities. They created an energy management system based on machine learning and stressed the significance of knowledge transfer and capacity development in adopting and deploying such systems. They suggested creating collaborations between the public and commercial sectors and creating training programs to ensure stakeholders have the abilities and information needed to utilize these systems successfully. As a result, capacity building and knowledge transfer are essential for the private and governmental sectors to collaborate successfully in the implementation of city projects, especially in the context of the development of smart cities. Some of the most effective methods for promoting capacity development and knowledge transfer include training and education, the creation of partnerships and networks, sharing best practices and lessons learned, and training and education. These tactics may support the adoption and use of technical standards, ensuring that they are adopted and put into practice, solve institutional and technical capability difficulties, and encourage the use of cutting-edge technologies like machine learning.

To explore the multifaceted interactions between PPPs and smart city innovations and developments from the view of smart city practitioners and consultants

Policy and Regulation

Policy and regulation play an essential role in facilitating the implementation of PPPs and smart city innovations. The studies reviewed in this analysis highlight the importance of

supportive policies and regulations, incentives for private sector participation, and addressing legal and ethical issues. Lam & Yang (2020) conducted a case study in Hong Kong to investigate the factors influencing the consideration of PPPs for smart city projects. The authors found that policy and regulation were among the most critical factors affecting the success of PPPs. The study highlighted the need for clear and transparent policies and regulations that provide a stable and predictable environment for private sector participation. Similarly, Irazábal & Jirón (2021) argue that PPPs and smart city innovations in Latin America face challenges related to policy and regulation. The authors highlight the importance of developing supportive policies and regulations that enable collaboration between private and governmental sectors and promote social and environmental sustainability. Li et al. (2022) conducted a Delphi study to identify the factors that drive policy transfer in smart city development. The study identified policy and regulation as one of the most critical factors influencing policy transfer. The authors emphasized the essence of understanding different countries' policy contexts and regulatory frameworks to facilitate policy transfer and implementation.

In a study on the rule of law and trust in the smart city paradigm, Keymolen & Voorwinden (2020) argue that regulation and governance are essential to ensuring trust and transparency in PPPs and smart city innovations. The authors emphasize the importance of establishing clear regulations and rules that protect the interests of all stakeholders, including citizens and private sector partners. Voorwinden (2021) explores the implications of privatization in the context of smart city developments. The study highlights the importance of developing regulations and policies that balance the interests of private and governmental sectors and ensure accountability and transparency in PPPs and smart city initiatives. Finally,

Desdemoustier et al. (2019) examine the appropriation of smart city technologies by local actors. The authors highlight the importance of involving local stakeholders in the development of policies and regulations that support the adoption and implementation of smart city initiatives. In general, the studies reviewed emphasize the importance of policy and regulation in facilitating PPPs and smart city innovations. Supportive policies and regulations, incentives for private sector participation, and clear rules and regulations are essential for ensuring the success of smart city initiatives and maximizing their benefits for all stakeholders. Governments, policymakers, and city planners must consider these factors when developing policies and regulations for smart city developments.

Stakeholder Engagement and Participation

Stakeholder participation and engagement are critical factors in the success of smart city projects and PPPs. According to Lam & Yang (2020), citizen participation is an essential factor in considering PPPs for smart city projects. The study found that public support and engagement can influence government decision-makers to pursue PPPs, and engaging stakeholders in the decision-making process can improve project outcomes and sustainability. Additionally, Irazábal & Jirón (2021) note that engaging with local communities is crucial for ensuring that smart city initiatives are responsive to local needs and desires. Li et al. (2022) point out that involving stakeholders in the smart city policy transfer process can also help ensure appropriate policies and practices transfer. The authors conducted a Delphi study to identify the factors that drive policy transfer in smart city development, finding that stakeholder involvement, particularly the involvement of end-users, is critical for successful policy transfer. However, involving stakeholders in smart city projects and PPPs is

challenging. Keymolen & Voorwinden (2020) highlight the importance of the rule of law and trust in smart city projects, particularly in PPPs where private entities may be responsible for critical infrastructure and services. The authors argue that involving stakeholders in decision-making and ensuring transparency can help build trust and mitigate potential risks.

Voorwinden (2021) further explores the role of PPPs in the privatization of the city and argues that PPPs can lead to the prioritization of private interests over public goods. The author suggests that involving stakeholders, particularly civil society groups, can help ensure that smart city projects prioritize public goods and the community's needs. Desdemoustier et al. (2019) investigate the appropriation of smart city initiatives by local actors and highlight the importance of involving a broad range of stakeholders. The authors suggest that engaging local actors in developing smart city projects can help ensure that projects are responsive to local needs and desires. In summary, involving stakeholders in smart city projects and PPPs is crucial for their success and sustainability. Participation by citizens, interaction with regional communities, and stakeholder cooperation may enhance project results and guarantee that initiatives are sensitive to regional needs and preferences. However, including stakeholders in the decision-making process is difficult; effective stakeholder engagement depends on maintaining openness and fostering trust.

Technological Innovation

Developing PPPs and smart city initiatives is now largely driven by technological innovation. Blockchain, IoT, and AI have all been cited as developing technologies that must be adopted for smart city infrastructure to become more effective, sustainable, and high-quality. The adoption of new technologies is a significant aspect that affects the selection of

PPPs for smart city projects, according to Lam & Yang (2020). The authors point out that adopting new technologies necessitates a substantial financial outlay, and PPPs provide a mechanism to mobilize the funds required to support the construction of infrastructure for smart cities. Irazábal & Jirón (2021) observe that the infatuation with global smart city models in Latin America has resulted in prioritizing technological innovation over the needs of local communities. The authors argue that a more nuanced approach is required, where local communities are involved in co-creating smart city solutions that address their specific needs.

Li et al. (2022) identify technology-driven policy transfer as a critical driver of smart city development. The authors note that technological innovations can potentially disrupt traditional governance structures, creating new opportunities for PPPs to emerge as key players in the delivery of smart city projects. Trust and the rule of law are critical factors that impact the adoption of emerging technologies in smart city projects. Keymolen & Voorwinden (2020) argue that trust between public and private stakeholders is essential in creating an environment that fosters innovation and promotes the adoption of emerging technologies. Voorwinden (2021) highlights the potential risks associated with the increased privatization of smart city infrastructure. The author notes that while PPPs can effectively mobilize resources and promote technological innovation, they also raise concerns about protecting public interests and the potential for commercial exploitation of public goods.

The necessity of including local players in the co-creation of smart city solutions is highlighted by Desdemoustier et al. (2019). The authors point out that local communities are in a good position to pinpoint the particular requirements and difficulties that smart city solutions need to solve. Projects for smart cities may be based on the needs of the

communities they serve by including local actors in the development process. Therefore, the growth of smart city initiatives and PPPs now heavily depends on technological innovation. Smart city infrastructure might become more effective, sustainable, and high-quality with new technologies like the IoT, AI, and blockchain. However, the adoption of new technology also gives rise to worries about the preservation of public interests and the possibility of exploiting public resources for profit. Involving local actors in co-creating smart city solutions is crucial to ensuring that they are based on the demands of regional communities.

4.3 Discussion

To assess the influence of PPPs on the success, performance, and sustainability of smart city projects

PPPs are being utilized more often to complete smart city initiatives. This is so that PPPs may build resilient, useful, and successful urban infrastructure by using the resources, expertise, and innovation of the private sector. When implementing PPPs in smart city efforts, there are benefits and challenges that need to be carefully considered. The effectiveness of PPPs in smart city initiatives also depends on stakeholder participation. The goals of the project should be in line with the interests and expectations of the stakeholders. Effective communication and cooperation among stakeholders may also assist in identifying project requirements and priorities, managing disputes, fostering trust, and ensuring project sustainability. In addition, sustainability is gaining importance in the use of PPPs in smart city initiatives. According to studies, including sustainability in the selection criteria for PPPs may support the development of more environmentally friendly infrastructure for smart city projects, attract private sector investment, provide employment opportunities, and boost the economies of smart cities.

The study by Selim et al. (2018) highlights the potential of PPPs to leverage the private sector's resources, expertise, and innovation to develop sustainable, efficient, and effective urban infrastructure. The study also emphasizes the importance of stakeholder engagement in achieving project success and sustainability. Lam & Yang (2020) identified stakeholder engagement as one of the factors influencing the consideration of PPPs for smart city projects. The authors emphasize that effective stakeholder engagement can increase the chances of PPP project success and ensure project sustainability. Sergi et al. (2019) also highlight the importance of stakeholder engagement in achieving economic growth in smart cities. The authors emphasize that stakeholder engagement can help create an enabling environment for PPP projects, promote private-sector investment, and create jobs. Hoeft et al. (2021) explore the role of robotics and automation in PPP projects toward life cycle sustainability. The authors contend that by lowering the environmental effect of building operations and raising energy efficiency, the employment of automation and robots in smart city infrastructure projects may promote sustainability. The report also emphasizes how automation and robots may help with infrastructure upkeep and operation in smart cities, resulting in sustainability over a longer period. Liu et al. (2021) proposed a conceptual framework for applying PPPs in developing smart city projects. The framework identifies several themes, including sustainability, that could influence the success of PPPs in smart city projects. The authors suggest that incorporating sustainability into the selection criteria for PPPs could lead to delivering sustainable infrastructure in smart city projects.

The study's findings are consistent with those of previous investigations. For instance, Lam & Yang (2020) and Selim & ElGohary (2020) stress the value of stakeholder participation in ensuring the success and sustainability of projects. Both Sergi et al. (2019)

and Hoeft et al. (2021) show how automation and robots can potentially increase project sustainability and efficiency. The results of Liu et al. (2021), which imply that including sustainability in the selection criteria for PPPs may result in implementing sustainable infrastructure in smart city projects, also provide credence to the study's conclusions. PPPs may be a successful model for the execution of smart city initiatives, according to the study's overall conclusions, provided that their advantages and disadvantages are properly taken into account. The success of PPPs in smart city projects also depends on stakeholder engagement because it can assist in coordinating project goals with stakeholders' expectations and interests, identifying project needs and priorities, resolving disputes, fostering trust, and ensuring project sustainability. Incorporating sustainability into PPP selection criteria might also support the development of more environmentally friendly infrastructure, increase private sector investment, provide employment opportunities, and boost the economy in smart cities. Stakeholder involvement and sustainability must be prioritized when designing and implementing PPP initiatives in smart cities.

To identify the best practices for successful collaboration between public and private sectors in implementing city projects

It might be useful to research the best practices for effective PPPs in implementing municipal initiatives to learn from cities that have succeeded in this attempt. According to the study's conclusions, effective partnerships between the public and commercial sectors depend on cooperative governance, data sharing and interoperability, capacity development, and knowledge transfer. Collaborative governance entails involving stakeholders, setting common objectives, and creating efficient communication channels to ensure that initiatives satisfy residents' requirements and provide concrete benefits. Adopting open data policy, creating

standards and protocols for data transmission, and promoting smooth data interchange across various systems and technologies are all aspects of data sharing and interoperability. Establishing training and certification programs, creating collaborations between the private and governmental sectors, and sharing best practices and lessons gained are all part of capacity development and knowledge transfer. These findings are supported by other studies conducted in the context of smart city development. For instance, Mora et al. (2019) analyzed European best practices in smart city development in a multiple-case study. They identified collaborative governance as a strategic principle underpinning successful smart city projects. Fernandez-Anez et al. (2018) developed an integrated conceptual model to examine smart city implementation and discourses, highlighting the importance of data sharing and interoperability as key factors that enable the private and governmental sectors to work together towards common goals. Lai et al. (2020) reviewed technical standards for smart cities, emphasizing the need for capacity building and knowledge transfer for the adoption and implementation of these standards.

However, several studies give conflicting conclusions on the optimal methods for effective public and private partnerships in municipal initiatives. For instance, Eitan et al. (2020) reviewed collaborative governance efforts and found that knowledge transfer and capacity development was required to improve public and private cooperation. The author pointed out that knowledge sharing and capacity development are necessary for successful cooperation, but they are often overlooked. According to Eitan et al. (2020), sustainable partnerships between the public and commercial sectors are unlikely to occur without adequate training and education for stakeholders. Overall, this research offers a thorough analysis of the ideal methods for effective PPPs in implementing municipal projects.

Although other research has reached different conclusions, this one offers important information on the tactics that may be used to achieve fruitful partnerships. According to the study's conclusions, effective partnerships between the public and commercial sectors depend on cooperative governance, data sharing and interoperability, capacity development, and knowledge transfer. These tactics may support the adoption and use of technical standards, ensuring that they are adopted and put into practice, solve institutional and technical capability difficulties, and encourage the use of cutting-edge technologies like machine learning. Therefore, while developing smart city initiatives, legislators and municipal administrators must prioritize these tactics.

To explore the multifaceted interactions between PPPs and smart city innovations and developments from the view of smart city practitioners and consultants

The literature review conducted in this analysis has highlighted the multifaceted interactions between PPPs and smart city innovations and developments. Stakeholder involvement and engagement, technical innovation, and policy and regulation have all been identified as important determinants of the success of PPPs and smart city initiatives. The studies under consideration stress the significance of encouraging laws and policies that foster cooperation between the private and governmental sectors and advance environmental and social sustainability. Smart city infrastructure might become more effective, sustainable, and high-quality with new technologies like the IoT, AI, and blockchain. However, the use of new technology also gives rise to worries about the preservation of public interests and the possibility of commercial exploitation of public resources. Stakeholder involvement is essential for the success and sustainability of smart city initiatives and PPPs, and establishing trust and openness is essential for effective stakeholder engagement. These results align with

previous research that looked at the function of PPPs and technological advancements in smart cities. For instance, research by Hu and Zheng (2021) discovered that stakeholder engagement and involvement, technical innovation, policy and regulation, and stakeholder engagement are crucial for effective cooperation between the private and governmental sectors in creating smart cities. The authors contend that supporting laws and regulations, incentives for private sector engagement, and clear norms and regulations are required to guarantee the success of smart city efforts and maximize their advantages for all stakeholders. Desdemoustier et al. (2019), in a similar vein, remark that including local actors in the creation of smart city initiatives may assist in guaranteeing that programs are responsive to local needs and wishes. The authors contend that including local stakeholders in creating smart city initiatives may guarantee that these initiatives are sensitive to community needs and preferences.

Although the literature examined for this analysis highlights the significance of policy and regulation, technological innovation, and stakeholder engagement and participation, other factors should be considered when analyzing the interactions between PPPs and smart city innovations. For instance, research by Späth & Knieling (2020) emphasizes the significance of financial resources in effectively implementing smart city initiatives. The authors contend that access to financial resources is vital for the execution of smart city initiatives and that PPPs may aid in bringing about the resources required to support the creation of smart city infrastructure. In addition, research by Li et al. (2021) pinpoints the importance of human capital to the accomplishment of smart city initiatives. According to the authors, the presence of competent workers is vital for realizing smart city initiatives, and PPPs may aid in luring and keeping the required people resources. In summary, our study of the literature has

brought attention to the complex relationships between PPPs and advancements in smart cities. Stakeholder involvement and engagement, technical innovation, and policy and regulation have all been identified as important determinants of the success of PPPs and smart city initiatives. However, other issues like available funding and human capital should also be considered. These results highlight the necessity for a comprehensive strategy for implementing PPPs and smart city initiatives that considers the many variables that might affect their performance. This analysis suggests that effective implementation of PPPs and smart city projects depends on supportive policies and regulations, incentives for private sector participation, clear rules and regulations, adoption of emerging technologies, and stakeholder engagement and participation.

Chapter 5.0. Conclusions and Recommendations

This section provides a summary of the research findings, key insights, and implications for practitioners, including potential areas for improvement and best practices. Recommendations for future research will also be outlined based on the findings, limitations of the study, challenges faced in the research, and the potential for further exploration of the topic.

5.1 Summary

It examines the role of PPPs in the success, performance, and sustainability of smart city projects. The study on PPPs in smart cities used a systematic approach to select relevant academic articles. The researchers initially searched 227 journal articles but refined their search criteria to select 140 articles published after 2018. After removing duplicates, they screened the remaining 77 unique articles for relevance, resulting in 53 relevant articles. Out of these, they identified 16 empirical studies on the process of PPP in smart city projects for inclusion in their content analysis. The researchers organized and analyzed the selected articles by comparing and contrasting them, allowing for analysis and synthesis. They aimed to assess the influence of PPPs on the success, performance, and sustainability of smart city projects, identify best practices for successful collaboration between private and governmental sectors in implementing city projects, and explore the interactions between PPPs and smart city innovations and developments. The selected articles included various types of studies, such as empirical studies and review articles, focusing on emerging themes of interest in PPPs in smart city projects. By examining these studies, the researchers hoped to identify patterns and themes across states that are useful in smart city research and practice.

The study highlights that PPPs can leverage the private sector's resources, expertise, and innovation to develop sustainable, efficient, and effective urban infrastructure. However, implementing PPPs in smart city projects presents benefits and challenges, and stakeholder engagement is essential to ensure project success and sustainability. According to the research, adding sustainability to the PPP selection criteria may help provide sustainable infrastructure for smart city projects. According to the study's findings, PPPs may be a successful model for the execution of smart city projects, provided that their advantages and disadvantages are properly weighed against one another, and sustainability and stakeholder participation are given top priority. The research also pinpoints the best public and private sector partnership methods to execute municipal initiatives successfully. The study suggests that collaborative governance, data sharing and interoperability, capacity building, and knowledge transfer are essential for successful collaborations between the governmental and private sectors. Engaging stakeholders, setting common objectives, and creating efficient communication routes are all part of collaborative governance. Adopting open data policy, creating standards and protocols for data transmission, and promoting smooth data interchange across various systems and technologies are all aspects of data sharing and interoperability. Establishing training and certification programs, creating collaborations between the governmental and private sectors, and sharing best practices and lessons gained are all part of capacity development and knowledge transfer.

The study results are corroborated by earlier research emphasizing the significance of stakeholder participation, automation, and robotics and adding sustainability into the selection criteria for PPPs. In the design and execution of PPP initiatives in smart cities, the report advises that sustainability and stakeholder participation be prioritized. The study also

offers helpful advice for politicians and municipal administrators on encouraging fruitful partnerships between the governmental and private sectors while carrying out local initiatives. As a result, the research adds to the expanding body of knowledge on the development of smart cities and offers insights into the function of PPPs in such initiatives. The study's conclusions may help municipal managers and politicians create successful PPP initiatives supporting sustainability, economic development, and stakeholder participation. The study also highlights the importance of collaborative governance, data sharing and interoperability, and capacity building and knowledge transfer in successful collaborations between governmental and private sectors in implementing city projects.

5.2 Recommendations

Prioritize stakeholder engagement in the design and implementation of PPP projects

The study's findings lead to several recommendations for incorporating PPPs into smart city projects. PPPs involve collaborating on the construction, design, financing, operation, and upkeep of public services and infrastructure. To effectively execute PPP projects in shrewd urban communities, focusing on partner commitment in the plan and execution of these projects is significant. This proposal depends on how partners can impact the achievement or disappointment of PPP projects. The identification and participation of all relevant stakeholders, including community members, industry experts, government officials, and other interested parties, are necessary for successful stakeholder engagement. Participating in the planning and execution of PPP projects with these stakeholders can help ensure that the project's goals align with the interests and expectations of these stakeholders. Projects that are more likely to satisfy the community's requirements will likely be more efficient and long-lasting as a result.

Participant involvement may also aid in determining the requirements and priorities of a project. This is crucial because it may guarantee that PPP initiatives are focused on the most essential and urgent problems that the community is now experiencing. Stakeholder involvement may also aid in resolving disputes that can occur throughout the planning and execution of the project. Delays and expensive disagreements, which may affect project timetables and budgets, can be avoided in this way. Stakeholder involvement may also contribute to increased trust amongst project participants. PPPs include cooperation between organizations from the public and private sectors, which may have various aims, objectives, and priorities. By including stakeholders, projects may be improved by fostering teamwork and the development of a shared purpose (Larsson & Larsson, 2020). By encouraging long-term investment in the project and commitment from stakeholders, effective stakeholder engagement may help assure project sustainability. Therefore, emphasizing stakeholder participation in the planning and execution of PPP initiatives is essential for the success of innovations for smart cities. Identifying project goals and priorities, managing disagreements, fostering trust, and ensuring project sustainability are all made possible through effective stakeholder involvement. Working together to establish a collaborative atmosphere that encourages open communication, transparency, and mutual respect is crucial for project managers and stakeholders.

Sustainability should be incorporated into the selection criteria for PPPs

PPPs involve collaborations between government bodies and private sector entities to develop and manage infrastructure projects to achieve mutual benefits. One critical aspect that needs to be considered when implementing PPPs in smart city projects is sustainability. Sustainable infrastructure is crucial for creating resilient, livable, and environmentally

conscious smart cities (Kaluarachchi, 2021). Therefore, sustainability should be incorporated into the selection criteria for PPPs. Incorporating sustainability into the selection criteria for PPPs has several benefits. First, it can encourage more sustainable infrastructure in smart city projects. PPPs may encourage the development of novel technology, components, and procedures that can lessen the environmental effect of smart city projects by prioritizing sustainability. This may result in smart cities using less energy, emitting fewer greenhouse gases, and having better air and water quality.

Second, promoting sustainability in PPPs can also help attract private-sector investment. A growing number of businesses in the private sector are considering funding sustainable infrastructure initiatives. Smart cities may take advantage of this expanding market and attract more private sector investment by emphasizing sustainability in PPPs. In turn, this may speed up the creation of employment and economic growth while facilitating the development and implementation of smart city technology and services. Third, establishing sustainability selection criteria for PPPs may assist in guaranteeing that smart city initiatives align with more general sustainability objectives. Smart city projects are often developed in broader sustainability frameworks, such as the United Nations Sustainable Development Goals (Kuttyet al., 2020). By prioritizing sustainability in PPPs, smart city projects can contribute to achieving these broader goals, such as reducing greenhouse gas emissions or promoting sustainable urban development. Finally, incorporating sustainability into PPP selection criteria can help enhance transparency and accountability in smart city projects. The effects of smart city initiatives on the environment, society, and economy may be measured and tracked using sustainability indicators. Smart cities may guarantee that

project achievements are reported and assessed against sustainability objectives by adding these indicators to PPP selection criteria, improving accountability and public confidence.

The potential of automation and robotics to improve project efficiency and sustainability

Automation and robotics are promising research areas with the potential to significantly increase the sustainability and efficiency of smart city infrastructure projects. First, smart city infrastructure projects may significantly influence the environment thanks to automation and robots. High levels of pollutants, noise pollution, and other environmental problems are often linked to construction activity. Adopting robotic and automated technology may reduce or even avoid these harmful effects. For instance, automated technology may eliminate the need for many humans and heavy machinery, which can help decrease emissions. Construction robots can also utilize exact measurements to cut waste. Second, energy efficiency may also be improved via automation and robots. Infrastructure for smart cities often depends on intricate systems that need constant oversight and control (Bamwesigye & Hlavackova, 2019). Robots and automation may significantly increase their efficiency by monitoring and making changes to these systems in real time. For instance, an automated lighting system may save energy usage by adjusting the streetlights' brightness and schedule depending on the presence of people and cars. Thirdly, by enhancing maintenance and operation, automation and robots may support the long-term viability of smart city infrastructure. Automation allows for more effective maintenance and repair operations, minimizing the need for extended road closures or other inconveniences. Automated systems also enable preventive maintenance and minimize the need for expensive repairs or replacements by monitoring and identifying possible concerns before they develop into serious ones.

Identifying the best practices for successful collaboration between public and private sectors is crucial for the success of PPP projects

Successful public-private sector partnerships need collaborative governance as a key component. This entails establishing a structure for group decision-making, deciding on shared objectives, and allocating duties. A collaborative approach ensures that stakeholders with various viewpoints and experience levels collaborate to develop solutions that address societal demands. Additionally, collaborative governance fosters a feeling of ownership and trust among stakeholders. Interoperability and data exchange are also necessary for PPP ventures to succeed (Curry et al., 2022). Innovations in smart cities depend on the capacity to transfer data across many systems and platforms. It makes it possible to combine data from several sources, which may facilitate the creation of new services and enhance decision-making. Interoperability guarantees smooth communication between various systems. This makes it possible to build a cohesive infrastructure that can accommodate a variety of smart city services.

Capacity building and knowledge transfer are also critical for the success of PPP projects. These activities can help establish training programs and certification schemes, form partnerships between governmental and private sectors, and share the best lessons and practices learned. Capacity building and knowledge transfer can also help develop a skilled workforce to drive innovation in digital city projects (Ferraris et a., 2019). By investing in human capital development, stakeholders can ensure the sustainability and long-term success of PPP projects. Effective communication channels are also crucial for successful PPP projects. Stakeholders should set up common objectives and participate in frequent communication. Additionally, they should make sure that decision-making is transparent and

that stakeholders are kept up to date on the project's status. Building trust and ensuring that initiatives satisfy community requirements may be achieved through efficient communication channels.

5.3 Future Studies

Despite the limitations and delimitations of the current study on PPPs in smart city projects, valuable insights were gained. Future studies might improve this study by using other research methods and methodologies to provide a more thorough grasp of the subject. One potential research area for the future is the use of hybrid approaches to collect information from a larger variety of primary and secondary sources. This strategy would gather both quantitative and qualitative data, allowing researchers to confirm their findings and triangulate their conclusions. Additionally, by considering the limits of employing just one research approach, mixed methods research would provide a more comprehensive grasp of the study issue. By enlisting people from a wider variety of locales, different future research might alleviate the geographic bias of the present one. This method would provide a more representative sample, enabling the results to be applied to a larger population. Researchers might learn more about how PPPs affect digital city initiatives in various settings by choosing participants from various locations and considering regional differences in regulations, resources, and social structures. Future research may use a longitudinal strategy for data gathering to lessen the impact of the study's period constraint. With this strategy, data might be gathered over a longer period, giving the study issue a more thorough grasp. Researchers were able to account for the progress of the digital city project by gathering information from both modern and historical sources.

Another potential research in the future would examine how PPPs affect smart city initiatives as seen through the eyes of the general public. This strategy would provide insightful information on how PPPs affect people's access to services, quality of life, and overall satisfaction with digital city initiatives. Researchers might find possible areas for development in smart city initiatives by considering the population's viewpoints, ensuring that they suit the demands of the people they serve. Future research may also examine the efficiency of various PPP models in digital city initiatives. Researchers might, for instance, compare the results of initiatives using old PPP models with those using more recent models, such as social impact bonds. Comparing several models allowed academics to pinpoint each one's advantages and disadvantages, giving decision-makers useful government information on which model to use for future initiatives. Lastly, future research might take a comparative tack, contrasting the results of PPPs in smart city initiatives with those of conventional public sector programs. In the context of digital city initiatives, this strategy would provide insights into the efficacy of PPPs as a paradigm for providing public services. Researchers might determine which model is more successful, efficient, and long-lasting by comparing the results of many models.

References

Ahad, M. A., Paiva, S., Tripathi, G., & Feroz, N. (2020). Enabling technologies and sustainable smart cities. Sustainable cities and society, 61, 102301.

Almarri, K. (2022). The value for money factors and their interrelationships for smart city public–private partnerships projects. Construction Innovation, (ahead-of-print).

Appio, F. P., Lima, M., & Paroutis, S. (2019). Understanding Smart Cities: Innovation ecosystems, technological advancements, and societal challenges. *Technological Forecasting and Social Change*, *142*, 1–14. https://doi.org/10.1016/j.techfore.2018.12.018

Bamwesigye, D., & Hlavackova, P. (2019). Analysis of sustainable transport for smart cities. Sustainability, 11(7), 2140.

Bao, F., Chan, A. P. C., Chen, C., & Darko, A. (2018). Review of Public–Private Partnership literature from a project lifecycle perspective. *Journal of Infrastructure Systems*, *24*(3), 04018008. https://doi.org/10.1061/(asce)is.1943-555x.0000424

Bayliss, K., & Van Waeyenberge, E. (2018). Unpacking the public private partnership revival. The Journal of Development Studies, 54(4), 577–593.

Braun, V., & Clarke, V. (2022). Conceptual and design thinking for thematic analysis. Qualitative Psychology, 9(1), 3.

Carbonara, N., & Pellegrino, R. (2020). The role of public private partnerships in fostering innovation. Construction management and economics, 38(2), 140-156.

Cheng, S., Yu, Y., Meng, F., Chen, J., Chen, Y., Liu, G., & Fan, W. (2023). Potential benefits of public–private partnerships to improve the efficiency of urban wastewater treatment. npj Clean Water, 6(1), 13.

Cui, C., Liu, Y., Hope, A., & Wang, J. (2018). Review of studies on the public–private partnerships (PPP) for infrastructure projects. International journal of project management, 36(5), 773-794.

Curry, E., Tuikka, T., Metzger, A., Zillner, S., Bertels, N., Ducuing, C., ... & García Robles, A. (2022). Data Sharing Spaces: The BDVA Perspective. In Designing Data Spaces: The Ecosystem Approach to Competitive Advantage (pp. 365-382). Cham: Springer International Publishing.

Desdemoustier, J., Crutzen, N., Cools, M., & Teller, J. (2019). Smart City appropriation by local actors: An instrument in the making. *Cities*, *92*, 175-186.

Eitan, A., Herman, L., Fischhendler, I., & Rosen, G. (2019). Community–private sector partnerships in renewable energy. Renewable and Sustainable Energy Reviews, 105, 95-104.

European Commission. (2019). *Public Private Partnerships in the EU: Widespread shortcomings and limited benefits*. Retrieved February 24, 2023, from https://www.eca.europa.eu/Lists/ECADocuments/SR18_09/SR_PPP_EN.pdf

European Investment Bank. (2022, February 28). *Public-Private Partnerships (ppps) financed by the European Investment Bank from 1990 to 2021*. European Investment Bank. Retrieved February 24, 2023, from https://www.eib.org/en/publications/epec-ppps-financed-by-the-european-investment-bank-since-1990-2021

Fernandez-Anez, V., Fernández-Güell, J. M., & Giffinger, R. (2018). Smart City implementation and discourses: An integrated conceptual model. The case of Vienna. *Cities*, *78*, 4-16.

Ferraris, A., Erhardt, N., & Bresciani, S. (2019). Ambidextrous work in smart city project alliances: unpacking the role of human resource management systems. The International Journal of Human Resource Management, 30(4), 680-701.

Ferraris, A., Santoro, G., & Papa, A. (2018). The cities of the future: Hybrid alliances for open innovation projects. *Futures*, *103*, 51–60. https://doi.org/10.1016/j.futures.2018.03.012

Fox, M. P., MacLehose, R. F., & Lash, T. L. (2022). Applying quantitative bias analysis to epidemiologic data. Springer International Publishing AG.

Gorelick, J., & Walmsley, N. (2020). The greening of municipal infrastructure investments: Technical assistance, instruments, and city champions. Green Finance, 2(2), 114–134. http://www.aimspress.com/fileOther/PDF/GF/GF-02-02-007.pdf

Hodge, G. A., & Greve, C. (2017). On public–private partnership performance. *Public Works Management & Policy*, *22*(1), 55–78. https://doi.org/10.1177/1087724x16657830

Hoeft, M., Pieper, M., Eriksson, K., & Bargstädt, H. J. (2021). Toward life cycle sustainability in infrastructure: The role of automation and robotics in PPP projects. *Sustainability*, *13*(7), 3779.

Hu, Q., & Zheng, Y. (2021). Smart city initiatives: A comparative study of American and Chinese cities. Journal of Urban Affairs, 43(4), 504-525.

Irazábal, C., & Jirón, P. (2021). Latin American smart cities: Between worlding infatuation and crawling provincialising. *Urban Studies*, *58*(3), 507-534.

Ismagilova, E., Hughes, L., Dwivedi, Y. K., & Raman, K. R. (2019). Smart cities: Advances in research—An information systems perspective. International journal of information management, pp. 47, 88–100.

Jain, N. (2021). Survey versus interviews: Comparing data collection tools for exploratory research. The Qualitative Report, 26(2), 541-554.

Johnson, J. L., Adkins, D., & Chauvin, S. (2020). A review of the quality indicators of rigor in qualitative research. *American journal of pharmaceutical education*, *84*(1).

Kaluarachchi, Y. (2021). Potential advantages in combining smart and green infrastructure over silo approaches for future cities. Frontiers of Engineering Management, 8, 98-108.

Karvonen, A., Cugurullo, F., & Caprotti, F. (2019). Inside smart cities. London, UK: Routledge.

Keymolen, E., & Voorwinden, A. (2020). Can we negotiate? Trust and the rule of law in the smart city paradigm. *International Review of Law, Computers & Technology*, *34*(3), 233-253.

Komninos, N., Pallot, M., & Schaffers, H. (2013). Special issue on smart cities and the future internet in Europe. Journal of the knowledge economy, 4, 119-134.

Kutty, A. A., Abdella, G. M., Kucukvar, M., Onat, N. C., & Bulu, M. (2020). A system thinking approach for harmonizing smart and sustainable city initiatives with United Nations sustainable development goals. Sustainable Development, 28(5), 1347-1365.

Lai, C. S., Jia, Y., Dong, Z., Wang, D., Tao, Y., Lai, Q. H., Wong, R. T. K., Zobaa, A. F., Wu, R., & Lai, L. L. (2020). A review of technical standards for smart cities. *Clean Technologies*, *2*(3), 290–310. https://doi.org/10.3390/cleantechnol2030019

Lam, P. T. I., & Yang, W. (2020). Factors influencing the consideration of public-private partnerships (PPP) for smart city projects: Evidence from Hong Kong. *Cities*, *99*. https://doi.org/10.1016/j.cities.2020.102606

Larsson, J., & Larsson, L. (2020). Integration, application and importance of collaboration in sustainable project management. Sustainability, 12(2), 585.

Lima, S., Brochado, A., & Marques, R. C. (2021). Public-private partnerships in the water sector: A review. Utilities Policy, 69, 101182.

Li, L., Taeihagh, A., & Tan, S. Y. (2022). What factors drive policy transfer in smart city development? Insights from a Delphi study. *Sustainable Cities and Society*, *84*, 104008.

Liu, T., Mostafa, S., Mohamed, S., & Nguyen, T. S. (2020). Emerging themes of public-private partnership application in developing smart city projects: A conceptual framework. *Built Environment Project and Asset Management*, *11*(1). https://doi.org/10.1108/bepam-12-2019-0142

Mora, L., Deakin, M., & Reid, A. (2019). Strategic principles for smart city development: A multiple case study analysis of European best practices. *Technological Forecasting and Social Change*, *142*, 70-97.

Neuendorf, K. A. (2018). Content analysis and thematic analysis. In Advanced research methods for applied psychology (pp. 211-223). Routledge.

Nguyen, T. T., Ngo, H. H., Guo, W., Wang, X. C., Ren, N., Li, G., ... & Liang, H. (2019). Implementation of a specific urban water management-Sponge City. *Science of the Total Environment*, *652*, 147-162.

O. Nyumba, T., Wilson, K., Derrick, C. J., & Mukherjee, N. (2018). The use of focus group discussion methodology: Insights from two decades of application in conservation. Methods in Ecology and evolution, 9(1), 20-32.

Okai, E., Feng, X., & Sant, P. (2018, June). Smart cities survey. In 2018 IEEE 20th international conference on high performance computing and communications; IEEE

16th international conference on smart city; IEEE 4th international conference on data science and systems (HPCC/SmartCity/DSS) (pp. 1726-1730). IEEE.

Pereira, G. V., Parycek, P., Falco, E., & Kleinhans, R. (2018). Smart governance in the context of smart cities: A literature review. *Information Polity*, *23*(2), 143–162. https://doi.org/10.3233/ip-170067

Pinz, A., Roudyani, N., & Thaler, J. (2018). Public–private partnerships as instruments to achieve sustainability-related objectives: the state of the art and a research agenda. Public Management Review, 20(1), 1-22.

Quan, X., & Solheim, M. C. (2023). Public-private partnerships in smart cities: A critical survey and research agenda. City, Culture and Society, 32, 100491. https://doi.org/http://dx.doi.org/10.5539/jel.v6n1p102

Rahman, S. (2020). The advantages and disadvantages of using qualitative and quantitative approaches and methods in language "testing and assessment" research: A literature review. *Journal of Education and Learning*, *6*(1), 102–112. https://doi.org/http://dx.doi.org/10.5539/jel.v6n1p102

Rodrigues, B., & Zucco, C. (2018). A direct comparison of the performance of public-private partnerships with that of traditional contracting. Revista de Administração Pública, 52, 1237-1257. https://www.scielo.br/j/rap/a/d5DXmsmpz7KvMkvwyzVgNSk/abstract/?lang=en

Ruggiano, N., & Perry, T. E. (2019). Conducting secondary analysis of qualitative data: Should we, can we, and how?. Qualitative Social Work, 18(1), 81-97.

Sánchez-Corcuera, R., Nuñez-Marcos, A., Sesma-Solance, J., Bilbao-Jayo, A., Mulero, R., Zulaika, U., ... & Almeida, A. (2019). Smart cities survey: Technologies, application

domains and challenges for the cities of the future. International Journal of Distributed Sensor Networks, 15(6), 1550147719853984.

Sarmento, J. M., & Renneboog, L. (2021). Renegotiating public-private partnerships. Journal of Multinational Financial Management, 59, 100661.

Selim, A. M., & ElGohary, A. S. (2020). Public–private partnerships (PPPs) in smart infrastructure projects: the role of stakeholders. *HBRC Journal*, *16*(1), 317-333.

Selim, A. M., Yousef, P. H. A., & Hagag, M. R. (2018). Smart infrastructure by (PPPs) within the concept of smart cities to achieve sustainable development. *International Journal of Critical Infrastructures*, *14*(2), 182. https://doi.org/10.1504/ijcis.2018.091943

Sergi, B. S., Berezin, A., Gorodnova, N., & Andronova, I. (2019). Smart cities and economic growth in Russia. In B. S. Sergi (Ed.), *Modeling Economic Growth in Contemporary Russia* (pp. 249–272). Emerald Publishing Limited. https://doi.org/10.1108/978-1-78973-265-820191010

Sergi, B. S., Popkova, E. G., Borzenko, K. V., & Przhedetskaya, N. V. (2019). Public–private partnerships as a mechanism of financing sustainable development. In M. Ziolo & B. S. Sergi (Eds.), *Financing Sustainable Development. Palgrave Studies in Impact Finance* (pp. 313–339). Macmillan. https://doi.org/10.1007/978-3-030-16522-2_13

Silva, B. N., Khan, M., & Han, K. (2018). Towards sustainable smart cities: A review of trends, architectures, components, and open challenges in smart cities. *Sustainable Cities and Society*, *38*, 697–713. https://doi.org/10.1016/j.scs.2018.01.053

Söderström, O., Paasche, T., & Klauser, F. (2020). Smart cities as corporate storytelling. In The Routledge companion to smart cities (pp. 283-300). Routledge.

Späth, P., & Knieling, J. (2020). How EU-funded smart city experiments influence modes of planning for mobility: Observations from Hamburg. Urban Transformations, 2(1), 1-17.

Suri, H. (2020). Ethical considerations of conducting systematic reviews in educational research. Systematic reviews in educational research: Methodology, perspectives and application, 41-54.

Taylor Buck, N., & While, A. (2017). Competitive urbanism and the limits to smart city innovation: The UK Future cities initiative. *Urban Studies, 54*(2), 501–519. https://doi.org/10.1177/0042098015597162

United Nations. (2019). *Sustainable development goals: United Nations Development Programme*. UNDP. Retrieved February 24, 2023, from https://www.undp.org/sustainable-development-goals

Vinod Kumar, T. M., & Dahiya, B. (2017). Smart economy in smart cities. In T. M. Vinod Kumar (Ed.), *Smart Economy in Smart Cities. Advances in 21st Century Human Settlements* (pp. 3–76). Springer. https://doi.org/10.1007/978-981-10-1610-3_1

Voorwinden, A. (2021). The privatised city: technology and public-private partnerships in the smart city. *Law, Innovation and Technology*, *13*(2), 439-463.

Wang, H., Xiong, W., Wu, G., & Zhu, D. (2017). Public–private partnership in public administration discipline: A literature review. *Public Management Review, 20*(2), 293–316. https://doi.org/10.1080/14719037.2017.1313445

World Bank. (2020). Public-Private Partnerships. World Bank. Retrieved February 24, 2023, from https://www.worldbank.org/en/topic/publicprivatepartnerships/overview

Xiong, W., Chen, B., Wang, H., & Zhu, D. (2019). Governing public–private partnerships: A systematic review of case study literature. Australian Journal of Public Administration, 78(1), 95-112.

Yigitcanlar, T., Desouza, K. C., Butler, L., & Roozkhosh, F. (2020). Contributions and risks of artificial intelligence (AI) in building smarter cities: Insights from a systematic review of the literature. Energies, 13(6), 1473. https://doi.org/10.3390/en13061473

Zekić-Sušac, M., Mitrović, S., & Has, A. (2021). Machine learning based system for managing energy efficiency of public sector as an approach towards smart cities. *International journal of information management*, *58*, 102074.