

Case Report

Constructing smart cities through the use of public-private partnerships: The case of Dubai in the United Arab Emirates

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Biygautane M, Clegg S. (2024).
Constructing smart cities through the
use of public-private partnerships:
The case of Dubai in the United Arab
Emirates. *Journal of Infrastructure,
Policy and Development*. 8(6): 3668.
<https://doi.org/10.24294/jipd.v8i6.3668>

ARTICLE INFO

Received: 14 December 2023

Accepted: 26 January 2024

Available online: 17 June 2024

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Abstract: This article analyses the case of Dubai's smart city from a public policy perspective and demonstrates how critical it is to rely on the use of the public-private partnership (PPP) model. Effective use of this model can guarantee the building of a smart city that could potentially fulfill the vision of the political leadership in Dubai and serve as a catalyst and blueprint for other Gulf states that wish to follow Dubai's example. This article argues that Dubai's smart city project enjoys significant political support and has ambitious plans for sustainable growth, and that the government has invested heavily in developing the necessary institutional, legal/regulatory, and supervisory frameworks that are essential foundations for the success of any PPP project. The article also points to some important insights that the Dubai government can learn from the international experience with the delivery of smart cities through PPPs.

Keywords: smart city; public-private partnerships; Dubai; information and communication technologies; governance; infrastructure integration; management; human factors

1. Introduction

The past fifty years have witnessed impressive developments in many areas within the six Gulf Cooperation Council (GCC) states (Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates [UAE]) that have managed to catch up with, and sometimes exceed, the developed world in some global rankings. These GCC governments have been the main providers of infrastructure and public goods in these countries since the discovery of oil and gas. It was critical that they create, from scratch, the rudiments of modern states, ranging from buildings, roads, and airports to investment in human capital. Moreover, as part of their social contracts and sharing of oil revenues, GCC states chose to provide free education and social benefits to all their citizens. This necessitated the role of government in financing such projects, which required substantial financial investment.

Since the last decade, this trend has started to change in response to various factors. First, GCC states have realized that pressure on governments to reduce accelerating public spending, uncertainty over fluctuating oil prices, and the implications of the 2007 global financial crisis on their budgets, necessitate new financing strategies that correspond with global practices. Second, implementation of New Public Management (NPM) practices within the GCC public sector was one of the key drivers in changing the GCC governments' attitudes toward public spending (Osborne, 2009). New service delivery methods took many shapes, and included the introduction of alternative models, such as contracting out, privatization and public

private partnerships (PPPs). GCC states have each adopted these models with quite different local characteristics in the past few years. Third, GCC states have recognized that attracting the private sector to provide infrastructure and services is inescapable if they wish to both lessen the financial burden on the government and also provide needed expertise and human capital to manage what is being created.

The GCC states are determined to minimize their reliance on natural resources gradually and use their oil and gas revenues to build the foundations of economically competitive markets that can serve as global powers in the provision of services. Since natural resources are no longer the main drivers of economic growth and competitiveness in a world that is becoming increasingly digitalized and information-driven, as well as carbon neutral, GCC states do not want to be left behind. Hence, they are investing heavily in sectors that will help to establish the rudiments of a knowledge society.

One example of a GCC city that has managed to transform its rentier-based economy to one that is increasingly shifting toward knowledge and innovation is Dubai. The second largest Emirate in the UAE with almost no natural resources left to exploit, its fossil fuel supplies having been exhausted, Dubai has managed to establish the necessary infrastructure and pathways for a state-of-the-art smart city. For the purposes of this article and the case it presents, a smart city is defined as a city that relies on “the use of Smart Computing technologies to make critical infrastructure components and services of a city—which includes city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient” (Washburn et al., 2010). However, with shrinking financial resources and a lack of expertise and human capital necessary to create a smart city, Dubai will most likely face numerous challenges in implementing its smart city vision and strategy if it cannot receive the active participation and involvement of the private sector.

The purpose of this article is to analyze the case of Dubai’s smart city from a public policy perspective and demonstrate the significance of the reliance on the use of the PPP model. Effective use of this model can support the building of a smart city that could potentially fulfill the vision of the political leadership in Dubai, as well as serving as a catalyst and blueprint for other Gulf states. This article argues that Dubai’s smart city project enjoys significant political support and has ambitious plans for the sustainable growth of Dubai. The government has invested heavily in developing the necessary institutional, legal/regulatory, and supervisory frameworks that are essential foundations for the success of any PPP project.

The article is organized as follows. After the introductory section, the second section discusses in some depth the arguments and debates surrounding the concepts of ‘smart cities’ and ‘PPPs’. It highlights the theoretical ambiguity and generalization that complicate our understanding of the meanings and pros and cons of smart cities and PPPs. Moreover, the section illustrates the fundamental components of a smart city and the critical factors that need to exist to guarantee its successful implementation. Likewise, the section outlines the benefits, for both the private and public sector, of adopting the PPP model to deliver services. The third section analyzes the origins, developments, mechanisms, and factors that gave birth to the smart city narrative in Dubai. The drivers behind implementation of the smart city vision in a short time span,

and the enablers of such an ambitious goal, are discussed in detail. Finally, the fourth section presents the opportunities and challenges of utilizing PPPs to fulfill the smart city ambition in Dubai. Attention is primarily paid to the unique contextual factors that hinder the successful operation of PPPs in Dubai. More importantly, the readiness of Dubai effectively to construct its smart city project through the PPP model is assessed. The conclusions and findings of this article will fill the existing gap in the literature on smart cities, which predominantly covers developed Western states and has not included emerging cases in the Gulf region that have promising potential to succeed.

2. Delivering smart cities through public-private partnerships (PPPs): Conceptual matters

2.1. Smart cities: Meaning, importance and relevance

Smart cities, characterized by the integration of digital technologies to enhance urban efficiency and sustainability, have emerged as a critical paradigm for addressing the complex challenges of contemporary urbanization (Joss et al., 2017). The importance of smart cities is underscored by a wealth of academic literature that explores the various aspects of their development, impact, and potential (Galdon, 2017). This discourse draws upon scholarly insights to elucidate the multifaceted significance of smart cities in the realms of environmental sustainability, economic development, social inclusivity, and urban resilience. Defining the “smart city” concept has been problematic (Daoudagh et al., 2021). There is no consensus among scholars about what precisely the concept means (Kitchin, 2022), thus creating vagueness and ambiguity around the debates surrounding smart city discussion in academia (Hollands, 2008). As Crivello (2013) states, the development of smart city discourse has taken place largely outside of the academic world, particularly in the private sector led by such multinational technology-focused companies as IBM, Cisco, and Siemens. These organizations promise to engineer and architecturally structure cities of the future that use technological tools to deliver “smarter” cities in terms of infrastructure and human resources (Grissi and Pianezzi, 2017). Hence, they have published numerous reports, books, and briefings about the critical role of smart cities in addressing the urban, environmental, and social challenges facing the globe. The private sector’s dominance over the smart city dialogue can, to some extent, justify the relative immaturity of discussions of this topic in the context of academia, where interest started to emerge in the wake of the smart city discourse in the areas of public policy, urban studies, and information and communications technology (ICT) (Joss et al., 2017). At present, there is an absence of a coherent and unified framework to study the smart city phenomenon, with the topic being looked at from different angles and perspectives, creating some uncertainty concerning what constitutes a smart city (Neirotti et al., 2014).

There have been many definitional and conceptual variants associating a smart city with a multitude of circumstances (Kitchin, 2022, Nam and Pardo, 2011). This makes it a “fuzzy” term that is used inconsistently to denote different things in diverse contexts. Sometimes, it refers to a city that is fully digitalized to serve the needs and expectations of a growing population in a limited urban context (Harrison et al., 2010;

Washborn et al., 2010). In others, it is defined as a city that capitalizes on its human and infrastructure capital to deliver high economic growth and sustainable development (Caragliu et al., 2013; Giffinger et al., 2007). Effective social participation and inclusion are viewed by Partridge (2004) as features of the smart city of the twenty-first century.

Charoubi et al. (2012) examined the literature surrounding the concept of a smart city from various disciplinary perspectives and provide a conceptual framework that places smart city definitions in their proper contexts in the available literature. They have identified eight domains and factors that define a smart city. They are management and organization, technology, governance, policy, people and communities, economy, physical infrastructure, and natural environment. They reached the conclusion that the smart city concept is still in its developmental stage, and that there are several “working definitions” of smart city rather than a single one. Moreover, Nam and Pardo (2011) further narrowed down the dimensions of a smart city to only three: technology, people, and community. They discussed each of these dimensions and tried to address the sources of confusion and ambiguity in defining a smart city within these three domains in the literature (Daoudagh et al., 2021). The definition that best captures what is a smart city in the context of Dubai, the empirical focus of this article, can be summed up as “the use of Smart Computing technologies to make critical infrastructure components and services of a city—which includes city administration, education, healthcare, public safety, real estate, transportation, and utilities—more intelligent, interconnected, and efficient” (Washburn et al. 2010).

Alcatel-Lucent (2010) categorizes smart projects into four basic approaches depending on the type of partnership between the private and public sectors, and the different players involved in the process, such as service providers, city planners, real estate developers, and non-government bodies. The categories, termed “boxes”, are: 1) The IT box where cities rely on small projects and funding from the private sector to achieve IT excellence; 2) The dream box where smart city projects are part of a wider range of plans to establish IT excellence (the public sector manages and contributes significantly to this type); 3) The fragmented box, which exists in countries where smart cities are created independently and do not fall under a specific plan or scheme and 4), The black box, where the government is the main leader of smart city projects and the key player in their management, with government inviting the private sector entities that it wants to collaborate with.

ICT is not an end in and of itself but a means that allows technological tools to be effectively used to address sustainability-related challenges faced by the world in the twenty-first century. ICT facilitates smartness; it does not wholly constitute it. Cohen (2012) developed a “Smart City Wheel” that puts the smart city concept in a comprehensive framework that includes both the components that define a smart city and the drivers that can potentially materialize them. The rationale behind developing a wheel that simplifies the smart city concept and puts it in a visual framework is to correct the over-emphasis on the ICT aspects of smart cities. It also contributes to filling the absence of an evaluative tool that could be used to rank countries globally on their “journey” toward achieving the goal of becoming a smart city (Albino et al., 2015). The six components are identified as smart people, smart economy, smart environment, smart government, smart living, and smart mobility. Cohen (2012)

believes that innovative solutions in business, environment, government, and mobility can create endless opportunities for governments to excel and simultaneously protect the environment. However, to do this means relying significantly on involving citizens in establishing the “vision” for such a smart city. He proposed that cities go “lean” in their approaches to the journey of becoming a smart city by identifying achievable goals in both the short and long terms. Hence, any specific smart city project will not be an attempt by the government and its people to imitate other countries’ experiences, but instead to exploit available ICT tools to address unique local challenges that their cities face. Moreover, they should guarantee that their smart city’s vision is aligned with strategic developmental goals that evolve with time.

At the heart of the contemporary smart city concept lies an aspiration for achieving environmental sustainability. Findings by Caragliu et al. (2009) demonstrated that smart city initiatives could contribute to mitigating environmental degradation and lowering carbon emissions, aligning with global efforts to combat climate change. More recent academic literature, such as the work of Albino et al. (2015), emphasizes the pivotal role of smart technologies in optimizing resource utilization and reducing environmental impact. The integration of the Internet of Things (IoT), data analytics, and sensor networks enables real-time monitoring and management of urban systems, facilitating more efficient energy consumption, waste management, and transportation.

The incorporation of renewable energy sources and sustainable practices in smart cities is a recurring theme in academic discussions. Studies, such as those by Neirotti et al. (2014) and Deakin and Al Waer (2011), highlight how smart cities prioritize the integration of clean energy solutions, such as solar panels and smart grids, to reduce dependence on fossil fuels. The implementation of sustainable urban practices not only aligns with environmental goals but also contributes to the long-term resilience of cities in the face of climate change. Academic literature on this subject emphasizes the importance of adaptive infrastructure and climate-conscious urban planning in building resilient smart cities (Ahvenniemi et al., 2017).

Resilience, both in terms of climate adaptation and crisis management, is a critical consideration in the discourse surrounding smart cities. Research by Romero-Lankao et al. (2016) explores how smart city technologies aid in climate resilience by providing early warning systems, facilitating adaptive infrastructure, and supporting disaster response efforts. The ability of smart cities to integrate real-time data and predictive analytics enhances their capacity to respond to unforeseen events, ensuring the safety and well-being of residents. Academic literature underscores the importance of resilience as a key attribute that contributes to the sustainability and longevity of smart cities in the face of evolving challenges (Hodson and Marvin, 2009).

Economic development is another focal point in understanding the importance of smart cities. The academic discourse on this subject, underscoring how smart city initiatives stimulate innovation, create job opportunities, and foster economic growth, is exemplified by Hollands (2008) and Giffinger et al. (2007). The infusion of digital technologies into urban infrastructure, often termed as the “smart economy,” attracts investments, cultivates entrepreneurship, and positions cities as hubs of technological innovation (Neirotti et al., 2014). Through case studies and empirical analyses, scholars have demonstrated the positive correlation between the adoption of smart

technologies and economic vitality in cities (Bibri, 2019).

The social dimension of smart cities is a crucial aspect explored in academic literature. Smart city initiatives aim to enhance the quality of life for residents by leveraging technology to address societal challenges. According to Nam and Pardo (2011), smart cities contribute to social inclusivity by employing technology to bridge the digital divide and ensuring that the benefits of urban development are accessible to all segments of the population. Nam and Pardo (2011) identify and organize the three key components of a smart city in the literature. They argue that a city is smart when it builds and invests on its human capital and ICT infrastructure to achieve sustainable development through participatory governance mechanisms. Physical and technological factors are inevitable when thinking of a smart city project. Accessibility of high-tech tools and systems is a fundamental prerequisite for any smart initiative. Such tools and systems constitute the backbone of connectivity among all components of smart cities. Multinational companies compete to provide affordable, sustainable, and reliable technological instruments for governments to be able to create the infrastructure necessary for building smart applications. While the technology factor is only one component of a smart city project, the tendency in the available literature is to overstress its importance and ignore the other two components that are equally, if not more, significant.

The human factor that underlines the smart city dialogue stresses the role of education in preparing people to become “smart citizens”. Smart cities are architecturally designed and built on the premise that people would effectively use them to drive sustainable economic and environmental growth. Therefore, it is essential to connect the capabilities of people and the tools designed for them to use. People need to be creative in problem solving and addressing challenges through new solutions based on the opportunities offered by their connectivity with each other and, more importantly, with decision makers and the private and business sectors. If the human element is not well prepared to utilize and exploit the benefits of ICT tools, or if the focus of the government is fully on developing ICT and ignores the human aspect, the smart city journey will never reach its destination. The concept of inclusive smart cities goes beyond technological access and extends to equal opportunities in education, healthcare, and public services (Zwick and Spicer, 2021). The literature emphasizes the role of citizen engagement and participatory governance in fostering social cohesion within smart cities (Yigitcanlar et al., 2018).

2.2. Smart cities: Their inherent risks and challenges

Smart cities, with their potential to revolutionize urban living through technological integration, also bring forth a spectrum of risks and challenges that merit careful consideration (Grossi and Pianezzi, 2017). Among these concerns, data protection issues stand out prominently as smart cities heavily rely on data collection, processing, and sharing. The risks associated with smart cities entail a nuanced understanding of data privacy challenges, cybersecurity threats, and the implications of ubiquitous surveillance. These risks highlight the delicate balance required for the responsible development of technologically advanced urban ecosystems (Kitchin, 2022). At the heart of the risks associated with smart cities lies the vast amount of data

generated by sensors, cameras, and other connected devices. This data encompasses a wide range of personal information, from mobility patterns to health records, creating a potential goldmine for those seeking to exploit or misuse sensitive information. The challenge of securing this data against unauthorized access or cyber threats becomes paramount (Akbari, 2022).

In the context of data protection, anonymization techniques are often employed to de-identify personal information. However, studies have shown that de-anonymization attacks, where seemingly anonymous data is re-identified, pose a significant threat. Researchers have demonstrated the ability to re-identify individuals by correlating seemingly anonymous data with publicly available information, raising concerns about the efficacy of current anonymization practices in the smart city landscape (Calandrino et al., 2011).

Smart cities, with their interconnected networks and plethora of devices, become attractive targets for cybercriminals (Zwick and Spicer, 2021). The integration of smart technologies into critical infrastructure, such as energy grids, transportation systems, and healthcare facilities, amplifies the potential consequences of a cyberattack. The Stuxnet malware, which targeted Iran's nuclear facilities, serves as a stark reminder of the real-world impact of cyber threats on critical infrastructure (Ranchordas, 2020). In the smart city context, an attack on connected devices can lead to disruptions in essential services, compromising public safety and well-being. Researchers have demonstrated vulnerabilities in smart city technologies, including traffic control systems and connected vehicles, highlighting the need for robust cybersecurity measures to safeguard against potential threats (Checkoway et al., 2011).

The regulatory landscape for smart cities is still evolving, presenting challenges in ensuring adequate safeguards for data protection. Different jurisdictions may have varying approaches to privacy regulations, complicating matters for global smart city deployments (Ramiro and Cruz, 2023). The absence of standardized frameworks and clear ethical guidelines can lead to disparate practices in data handling and privacy protection. In response to these challenges, some regions have begun to enact legislation to address data protection in the smart city context. The European Union's General Data Protection Regulation (GDPR), for example, places stringent requirements on the processing of personal data, emphasizing transparency, user consent, and the right to erasure. However, the global nature of smart city technologies requires collaborative efforts to establish comprehensive, universally applicable standards (Micheli, 2022).

The risks associated with smart cities extend beyond technical vulnerabilities to encompass social implications and equity concerns (Hacker and Neyer, 2023). The collection and analysis of vast amounts of data can inadvertently reinforce existing societal biases, leading to discriminatory outcomes. For instance, predictive policing algorithms trained on historical crime data may perpetuate biases inherent in the ways in which the data was compiled, disproportionately impacting marginalized communities (Angwin et al., 2016). Moreover, the digital divide poses a significant risk to equity in smart cities (Datta, 2020). As technologies become increasingly integrated into urban life, those without access to digital devices or reliable internet connectivity risk exclusion from essential services and civic participation. The deployment of smart city initiatives should, therefore, be accompanied by efforts to

bridge the digital divide and ensure that the benefits of technology are accessible to all segments of the population (Kitchin, 2016).

2.3. Rationale(s) behind adopting PPPs for infrastructure development

This section explains the rationale for adopting infrastructure PPPs and outlines the benefits for the private and public sectors of adopting the PPP model to deliver services. Following this, a further subsection analyzes factors leading to the successful or unsuccessful implementation of PPPs based on existing academic and practitioner-oriented literature. Such an analysis is essential, since Dubai can benefit from broader international experience with the multifarious factors affecting the performance of PPPs in general (Caldwell and Keating, 2004; Ernst and Young, 2013).

Collaboration and partnerships emerge as significant themes in academic discussion of smart cities. The interconnected nature of smart city development necessitates collaboration between various stakeholders, including governments, private sector entities, academia, and citizens. Academic literature emphasizes the role of collaborative governance structures in fostering innovation and ensuring the successful implementation of smart city initiatives (Bettencourt, 2014). Public-private partnerships (PPPs) are often highlighted as the crucial mechanisms for financing and delivering smart city projects (Janssen et al., 2017).

In most Western countries, PPPs only appeared after years of contracting out and privatization and were largely driven by the search for efficient and competitive infrastructure delivery methods (Teicher et al., 2006). Governments adopt PPPs for multifarious reasons, but since most PPP-adopting governments face budgetary constraints that limit their capacity to finance infrastructure services, cost-effectiveness is often foremost among them. When their contractual arrangements are designed correctly, PPPs provide value for money and ensure “the best possible outcome at the lowest possible price” (English, 2006, p. 254). This value can take many forms, including “lower construction costs, lower operating costs and more efficient maintenance in the long run” (Webb and Pulle, 2002, p. 5). The private sector must perform well to earn profits from projects, performance that enhances the quality of services as well as minimizing costs. Another source of value for money arises from the “bundling” of services. The obligation to build, operate, maintain, and transfer an asset to the state at the end of the contract term provides an additional incentive to minimize the project’s costs (English, 2006). The efficiency of the service provided is thus maximized through effective and efficient design and construction of infrastructure projects with costs kept to a minimum.

Another reason for adopting PPPs is the transfer of risk to the private sector, usually thought of as the party that can best handle the risks associated with a project (Grimsey and Lewis, 2000). Risk transfer is one of the critical drivers of value for money and justifies a government’s reliance on PPPs, since without a significant risk being borne by the consortium, PPPs would be unable to achieve the desired levels of efficiency and value for money (English, 2006). Such risks could be related to construction, market size, cost of operations and maintenance, delays in finishing a project, force majeure, or any changes to existing laws and regulations. PPPs are ultimately adopted because government bureaucracy does not provide the necessary

mechanisms and incentives to encourage efficient and effective infrastructure services that can be delivered on time. Moreover, any extra costs caused by time delays or performance failures that are not priced into government borrowing are then borne by taxpayers (NSW Office of Financial Management, 2002). Because the private sector is restricted by a tight budget and limited resources, and cannot levy extra charges on citizens, this forces the private sector to deliver its services with minimal costs and higher quality if it is to generate higher profit.

2.4. Factors behind PPP success or failure: Lessons from international experiences

This section explores some of the factors behind the success or failure of PPPs based on international experiences.

PPPs are no longer adopted only to deliver heavy infrastructure projects, but also to build ICT capacity and construct smart city projects. A report by Alcatel-Lucent (2010) demonstrates that PPPs have the potential to “incorporate” the use of ICT tools in innovative ways to improve services related to education, transportation, economic development, public safety, health care, and social services. Achieving this is essentially attributed to the construction of a business model that can guarantee access to these services at an affordable price. Governments worldwide are now setting up the regulatory and legal frameworks and policies to allow PPPs to operate in a more transparent manner and become an integral part of their national strategic objectives. Countries in North America, the OECD, and Asia are currently reviewing their PPP models to focus on ICT development and deployment.

Western countries have primarily used PPPs to construct large-scale infrastructure and public assets, such as freeways, tunnels, bridges, and social projects such as hospitals, schools, and prisons. Many such projects have accomplished their desired outcomes in implementation; nonetheless, many other projects also failed to deliver the desired outcomes. The successful projects can provide lessons on how better to manage PPPs’ associated risks and achieve superior value for money (Darvish et al., 2006; Grimsey and Lewis, 2007). In Australia, for example, the New South Wales government has enjoyed the successful delivery of many social infrastructure projects under the PPP model. These include the redevelopment of the Newcastle Mater Hospital, the Long Bay Prison and Forensic Hospitals, and the New Schools Phases 1 and 2 (Kozarovski, 2006). According to Kozarovski (2006), these projects delivered value for money, particularly in the case of the New Schools Phases 1 and 2, because the government managed to secure savings of 7% and 23%, respectively. Even more significantly, these projects were delivered on time and within budget (Kozarovski, 2006). Another example of a successful PPP project is Melbourne’s City Link Road infrastructure project, one of Australia’s largest BOOT projects. Most of the project’s commercial risks were borne by the private sector, which managed to finish the project within the anticipated timeframe and budget. Careful analysis of factors leading to the achievement of such projects reveals that accountability and transparency throughout the process, the competitiveness of bids, appropriate risk management, as well as other factors, contributed to their successful delivery.

Nevertheless, not all PPP projects in Australia have been so successful (Forward,

2006), and the Sydney Airport Rail Link is one example of a failure to achieve anticipated results or meet the performance targets indicated in a contract. Darvish et al. (2006) investigated the reasons behind this PPP project's nonsuccess to develop recommendations on how to avoid repeating similar mistakes in the future. They found that various factors led to the failure of the Airport Rail Link project, including the "unusual" and "careless" division of responsibilities between the public and private sectors, which did not adequately take into consideration the project's inherent risks (Darvish et al., 2006, p. 24). Even worse, the government signed the PPP contract without clearly specifying the risks that would be transferred to the private sector. Ultimately, the risk allocation structure of the project was "inappropriate", as the private partner had to shoulder very few risks while it became the government's responsibility to handle most hazards associated with the project's design and implementation. This risk allocation structure, which left the public sector handling most of the project's liabilities, stands in contradistinction to the primary objective of a PPP in this regard, which is to transfer risks to the party best prepared to handle them.

Despite the positive outcomes that PPP projects promise to achieve, failure to deliver the expected outcomes can result when their implementation is not carefully designed. For instance, Bovaird (2004) states that one of the major problems of the partnership approach—when it is not well planned—is the concomitant fragmentation of structures and processes, which then leads to a "blurring" of responsibilities and accountability (p. 203). Bovaird (2004) goes further to explain how PPPs had caused governance and accountability problems when they failed to reveal important performance-related information to the public on the grounds of "commercial confidentiality" or "data protection" (p. 203). In the same context, Sands (2006) argues that commercial confidentiality clauses reduce transparency and limit the public's access to the previously available information. This then "leaves the door open" to undesirable practices, such as corruption, patronage, and "kickbacks," which can ultimately undermine administrative processes and, to varying degrees, call into question the performance of the partnership agreement itself (Sands, 2006, p. 9). Furthermore, Sands (2006) states that while too much transparency can result in many disadvantages for the private sector, too little can affect citizens' access to public information, thus balancing the interests of the two parties involved in PPPs is essential to their success. Other issues, such as the contractual structure's inherent complexity, can result in more extended negotiation periods, and the ballooning of up-front costs of PPP projects being much higher than those of more conventional procurement methods (Darvish et al., 2006).

3. Smart cities in Dubai: Origins and readiness, vision and initiatives

Dubai's smart cities journey is characterized by revolutionizing urban living through technological integration, coupled with a strong commitment to excellence in outcomes and a pioneering spirit in achieving them. The city's leadership recognizes that technological innovation is not an end in itself but is a means of enhancing the quality of life, fostering sustainability, and driving economic prosperity. As Dubai continues to evolve as a smart city, it serves as an example for urban planners and

policymakers worldwide, illustrating how a holistic and strategic approach to technology can redefine the urban landscape. The integration of smart technologies into the fabric of Dubai’s governance, infrastructure, and daily life, is positioning the city at the forefront of the global smart city movement, inspiring other urban centers to embark on their transformative journeys.

The smart city narrative is not new in Dubai. Over the past ten years Dubai and the UAE have emerged as hubs for innovation and excellence in their use of ICT in the Middle East and North Africa (MENA) region. Since Dubai is rapidly depleting its natural resources, it has invested quite heavily in building the necessary infrastructure to compete globally as a knowledge- and innovation-driven economy. Thus, it aligned its strategic economic objectives with sectors that guarantee the creation of knowledge, provision of services, and tools that could enhance its global rankings in these areas. Furthermore, as **Figure 1** demonstrates, Dubai is witnessing drastic levels of population growth that necessitate a smarter approach to city development. A smart city model would enable Dubai to sustain its current levels of population growth while developing new sustainable models of infrastructure development.

The Ruler of Dubai, Mohammed Bin Rashid Al Maktoum, has been instrumental in incrementally and gradually driving Dubai to become a smart city. From 2000 to 2010, the focus of his government was on transforming Dubai from a city that relied on traditional public communication and service delivery channels to ones that were digitalized. Hence, the E-government Department was created to channel and align the efforts of all government entities within the Emirate to embrace e-government solutions and tools in delivering services to the public. Once this objective was achieved and all government entities provided their services online, the vision was revisited and the new challenge were set for government entities to offer all services from smartphones. Thus, in June 2013, the Ruler of Dubai decreed that the government entities had three years to achieve this new milestone of delivering all services to the public via smartphones. This resulted in changing the name of the E-Government Department to the Smart Government Department to reflect the government’s new direction.

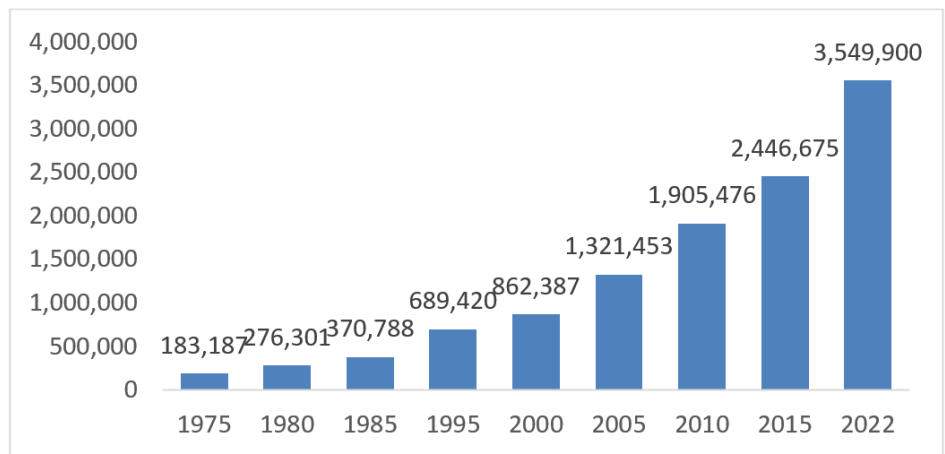


Figure 1. Population growth in Dubai between 1975 and 2022.

Source: Dubai Statistics Center (2023).

The vision for a smart government is to ease the lives of people and businesses interacting with the government and by doing so contribute to establishing Dubai as a leading economic hub. It was the year 2013 that witnessed the birth of a smart city project in Dubai, with a time frame of three years to equip the Emirate with the full ICT infrastructure to create a city that dynamically links people, government, and the private sector. The statement of the idea to embrace a smart city policy was initiated by the Ruler of Dubai on 5 March 2014. He affirmed, “[the] country is today ushering a new era for the improvement and development of quality of life through this gigantic project which got underway through an unprecedented public-private partnership (Sambidge, 2014).” The vision is to make public services available to the citizens and residents of Dubai at the touch of a button, and to facilitate their day-to-day activities to achieve “happiness” and satisfaction.

Dubai’s smart city strategy is based on six pillars and one hundred initiatives. These pillars are smart economy, lifestyle, transportation, governance, environment, and generation, as illustrated in **Figure 2**. The aim is to make Dubai’s smart city’s model comparable to those of Barcelona, Amsterdam, and other globally renowned smart cities. Dubai smart city’s strategic plan is founded on three principles: 1) facilitation of communication among the public sector, the people, and the business sector, 2) integration of people in decision-making through ICT tools, especially in matters that relate to their well-being, and 3) cooperation among all private and public entities to deliver the best possible value for residents of Dubai.

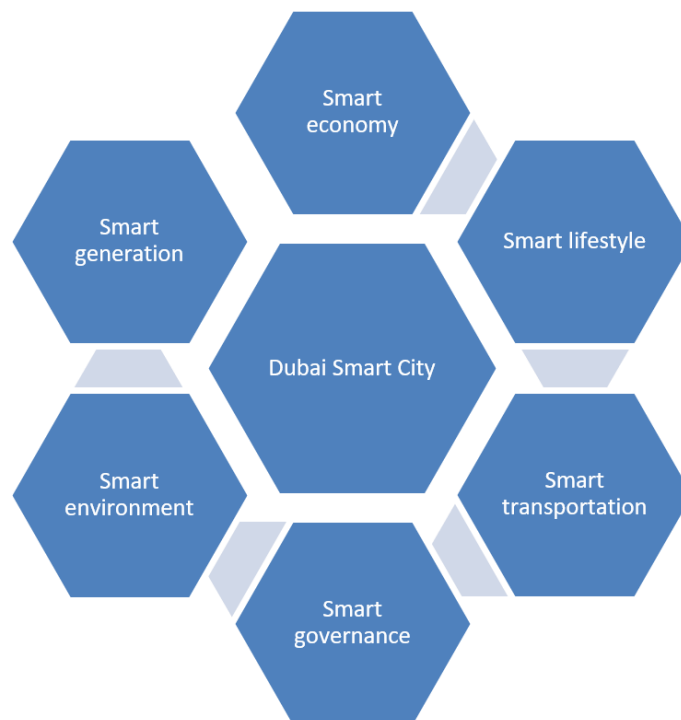


Figure 2. Components of the Dubai Smart City model.

4. Potential of PPPs to deliver the smart city project in Dubai: Opportunities and challenges

4.1. How essential is the PPP model for Dubai’s smart city initiative?

The successful achievement of Dubai's smart city initiative relies quite heavily on successful collaboration with the private sector through a PPP model. In its search for sustainable development, more citizen engagement in decision-making, and transformation of the economy into one that is knowledge- and innovation-based, Dubai must effectively engage the private sector to address its shortage of both the financial and human resources essential for establishing a smart city. Dubai was badly hit by the 2007 financial crisis that left it burdened with more than \$US 80 billion in debt (Gulf News, 2009). To continue creating the smart city, the government will need to borrow further from international and national banks to cover the huge expenses that a project of this magnitude necessitates. Moreover, securing the talent needed to build, maintain, and sustain the smart city project is another challenge that Dubai has to come to terms with.

The contemporary era is no longer one of public versus private, state versus business, but one of both public and private sectors collaborating to deliver public services by utilizing the things they are best at. Hence, the private sector can provide Dubai with the financing required to establish a smart city and the skills required to operate and sustain it, while the public sector can facilitate the processes involved in creating it and establish the legal and institutional capacity to provide the private sector with an ecosystem in which it can operate smoothly. This will not only bring numerous opportunities for Dubai in its smart city project, but will also further stimulate innovation and strategic partnerships in other areas.

The proper utilization of PPPs to build its smart city project can bring Dubai numerous advantages and minimize the disadvantages that could potentially result from a project of such magnitude. There are several advantages to implementing a PPP model to drive the smart city project as drawn from the literature about this topic. What tops the advantages section shown in the table is facilitation of creativity and innovation. The private sector enjoys access to the talent, human capacity, and tools necessary to trigger creativity, innovation, and knowledge transfer. Moreover, engagement with the private sector in delivering its smart city project can, to some extent, guarantee that the government of Dubai achieves value for money, proper transfer of risks, and higher quality of services and products associated with the design of the project. At the same time, there are some disadvantages that result from PPP projects when they are not carefully implemented. Critics stress the difficulty of achieving functional and service specifications that are usually set high before the commencement of a project. Also, high costs incurred from contract drafting, the difficulty of transferring all risks associated with a project to the private sector, and the unavoidable limits of accountability and transparency exert a great amount of pressure on both the public and private sectors. The contract design stage is critical for both sectors, as establishing clear clauses and agreements can eliminate the potential risk of disputes between the two parties.

4.2. How ready is Dubai to successfully implement its smart city through the PPP model?

Over the past two decades, Dubai has relied on the experiences of international consulting companies that have implemented a number of public policies, international

best practices, and management solutions. Since Dubai wanted to rapidly catch up with the rest of the world, it has had to act quickly and borrow public policies that have worked and delivered results in developed countries, without paying careful attention to the cultural and contextual factors that might hinder the effectiveness and success of those policies. Management consultancies have been widely used by the governments of the GCC to emulate policies that have worked overseas and to implement them locally (Dulaimi et al., 2010). On many occasions, this has resulted in the dramatic failures of some consultancy projects, costing governments millions of dollars that did not deliver what was expected (Dulaimi et al., 2010). Institutional mimesis depends on a receptive repertoire of infrastructural capabilities and affordances that can be lacking. Some PPPs unfortunately provide examples of mimetic policies that have not operated effectively given the absence of an environment that supports them.

While the political leadership of Dubai fully supports the smart city project, the city still faces numerous institutional, governance, and legal hurdles to make PPPs an operational tool to achieve the smart city goal (Halaoui et al., 2012). Over the past ten years, more than a hundred infrastructure projects have been developed throughout the entire GCC region using PPPs, but without relying on any clear frameworks or models. They were simply conducted on contractual and ad hoc bases. Furthermore, PPPs have been used in many cases in the UAE and Dubai, but in the absence of policies, legal frameworks, or laws governing PPPs, the private sector has been hesitant to enter into partnership with the public sector. In fact, scrutinizing Dubai's contextual factors and customizing the importation of PPP policies to meet the local context is essential for their success (Holden, 2009). It was imperative to develop a unique PPP model that is pertinent to Dubai, one that fitted its unique political, economic, and social characteristics, rather than import an approach that has worked well in other institutional environments that do not match the affordances, or lack of them, characterizing Dubai.

Establishing the proper legal and policy grounds for PPPs to deliver the smart city project in Dubai is a must for it to succeed. In recognition of this, Dubai adopted a PPP law in 2015 that provides the necessary legal and regulatory frameworks to enable PPPs, which can be viewed on the Government of Dubai's Department of Finance webpage (<https://www.dof.gov.ae/en-us/pnp/Pages/PPP-Unit-Information.aspx>). The law is designed both to cater to the interests and protect the rights of public and private institutions, entering into collaborative agreements. Dubai's Department of Finance also hosts a PPP unit that monitors and administers PPP projects. Private sector companies need to consult and involve numerous government entities that are scattered across the country in terms of their geographic locations and mandates. Some PPPs require the involvement of different ministries, authorities, and entities that sometimes ask for countless documents, making compliance an almost impossible mission. Hence, simplifying, streamlining, and reducing the burden of bureaucracy on the private sector will be an enabling factor that can facilitate the process of establishing PPPs. Learning from other international contexts, this could be achieved by creating a one-stop shop PPP unit that takes care of all of the necessary paperwork. More importantly, such a unit would be responsible for conducting feasibility studies and ensuring that the proposed PPP project is aligned

with Dubai’s economic objectives and priorities.

Having solid governance frameworks and accountability measures is essential for PPPs to deliver successfully in Dubai. Creation of a regulatory framework is a key enabler for the success of PPPs, as it protects the interests of all players in the PPP agreement. A government unit empowered to play such a role will attract the interest of both public and private entities to collaborate in creating public value, while also protecting their rights. The technical and legal expertise necessary for administering PPPs can potentially be provided by such a unit, which would be representing the public sector in the different stages of the PPP agreement. PPPs require advanced technical skills in identifying potential PPP projects, contract drafting, negotiation of risk transfers, and implementation of projects. Moreover, the public sector is usually at a comparative disadvantage in PPP contracts when it lacks experts that could protect its rights in cases of disputes. Hence, attracting and maintaining skilled public sector talent is essential if Dubai wishes to successfully implement a smart city that is sustainable and serves the best interests of both the public and private parties forming the partnership.

Figure 3 presents the three key frameworks and enabling dynamics that the Dubai government needs to implement to secure a sound ecosystem and landscape for its smart city project. First, an institutional framework ensures the existence of a body that anchors the government’s efforts and initiatives to implement successful PPP projects. The PPP unit within Finance Department is essential in Dubai to allow a streamlined and simplified process for both the public and private entities intending to enter into a PPP contract. An observation of international practices in administering PPPs reveals that the existence of enabling institutional factors is critical. These units usually provide both technical support and advisory services to private and public entities before they even engage in any projects. Furthermore, Dubai’s smart city project will be complex to manage because of its cross-sectorial nature. It will encompass economic hubs, government entities that provide smart services, smart urban infrastructures, smart educational solutions, smart residential complexes, and environmentally friendly initiatives.

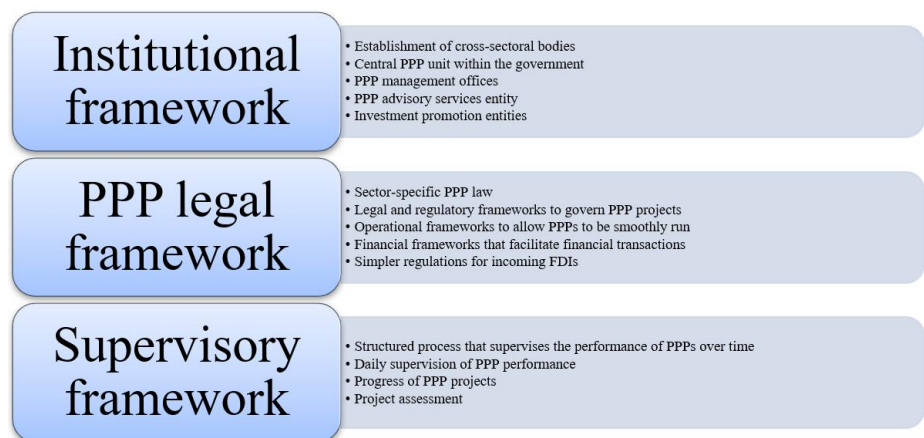


Figure 3. PPP essential requirements to support Dubai’s smart city project.
Source: Adapted from Halaoui et al. (2012).

Managing such a web of cross-sectorial entities requires a central body that

ascertains collaboration and maintains integrity and smoothness of the long processes that PPPs require before they mature into a contract. An entity dedicated to investment promotion could be a part of this institutional framework. Its duty should be to promote Dubai's smart city initiative and showcase the potential of Dubai as a leading service hub in the MENA region. Further, establishing a sound and clear legal environment that is supportive of PPPs is a key driver that will encourage private sector entities to comfortably invest in Dubai's smart city project. A sector-specific PPP law defining matters of legislation, governance and legal frameworks must secure the rights of investors from both the private and public sectors. A framework for handling common disputes that emerge while administering long-term contracts must be institutionalized. Hence, both parties know that, in the case of a breach of contract, there is a legal authority with explicit laws that can solve their disagreements or disputes. This provides a significant amount of confidence, especially to the private sector, which is the bearer of risks. Having a supervisory framework ensures that PPP projects are monitored on a continuous basis throughout the project cycle. This guarantees that projects are in line with the contractual and legal agreements that were put into place before the start of these projects. Moreover, following up on the public and private sector entities in meeting their deadlines and achieving the milestones of their projects acts as a proactive mechanism to avoid future disputes or disagreements, especially during the time of project delivery.

4.3. What lessons can Dubai learn from successful international PPP cases?

There are numerous lessons that Dubai can learn from global experiences with PPPs. These lessons can serve as useful tools to make a PPP smart city project perform better and come up with the desired results. In Dubai, as the city embraces its role as a leading smart city, data protection challenges come to the forefront. The extensive use of IoT devices, smart sensors, and AI-driven systems generates a substantial amount of personal and sensitive information. With the ambitious Smart Dubai 2021 strategy, the city aims to integrate data for improved services, but doing this raises concerns about the security of such data. Ensuring robust encryption protocols, data anonymization techniques, and stringent access controls become imperative to safeguard against unauthorized access and potential cyber threats.

The rapid adoption of smart technologies in Dubai makes it a potential target for cyber threats. The interconnected nature of the city's critical infrastructure, including smart transportation systems and energy grids, poses a heightened risk. The Dubai Cyber Security Strategy was launched to fortify the city's digital defenses, and this strategy highlights the proactive approach the Emirate is taking to address cybersecurity threats. Continuous monitoring, threat intelligence sharing, and collaboration with international cybersecurity experts have become crucial elements in securing Dubai's smart city infrastructure.

Dubai's smart initiatives are designed to enhance the quality of life for residents and visitors alike. Dubai's commitment to becoming a city for all is reflected in initiatives like the Dubai Digital Inclusion Strategy. This strategy aims to bridge the digital divide, ensuring equitable access to smart services and addressing social

implications associated with biased algorithms. The potential for unintentional bias in data analysis and the risk of excluding certain segments of the population from digital benefits necessitate careful consideration.

The regulatory landscape in Dubai is constantly evolving to meet the challenges posed by smart city technologies. While the Emirate doesn't fall under the jurisdiction of GDPR, it has taken steps to enact robust data protection laws. The Dubai Data Law of 2015 outlines the principles and regulations governing data usage. As Dubai continues to position itself as a global smart city hub, aligning its regulatory frameworks with international best practices becomes essential for ethical and responsible smart city development.

The Dubai's government and its leadership's commitment to responsible smart city development is exemplified through its adoption of privacy by design principles. The Smart Dubai Platform, a centralized hub for city data, emphasizes transparency and user consent. The Emirate actively involves citizens in decision-making processes through initiatives like Smart Dubai's Happiness Meter. The Dubai Electronic Security Center plays a vital role in implementing robust cybersecurity measures, ensuring secure data handling and reducing vulnerabilities in the city's digital infrastructure.

Governance and accountability issues are of paramount significance if PPPs wish to achieve better results in Dubai, especially in gaining greater acceptability and trust from the public, as Bovaird (2004) recognized early. PPPs are more likely to fail when governance risks are not carefully and thoroughly assessed, or when they do not prioritize citizens' concerns and share the outcomes of the partnership. Although some PPPs are commercially successful, when the partnership is a two-way affair between government and business sectors, rather than directly including citizens' interests, such successes should be questioned. Lack of citizens' involvement in these partnerships compromises the right for them to voice their interests.

5. Conclusion

This article has examined the potential of Dubai's smart city project being constructed through the use of a PPP model. It has provided a holistic picture of the conceptual arguments surrounding both smart cities and PPP models in the literature. The article advocates a strategic approach to the implementation of Dubai's smart city project through PPPs. It highlights the necessity of well-established legal, institutional, and supervisory frameworks as prerequisites before entering into any contractual arrangements. This strategic proposition is grounded in the long-term vision of protecting the interests of both the private and public sector entities engaged in this project. Moreover, it shed light on the readiness of Dubai's ICT infrastructure to support a project of such a magnitude.

By underlining the importance of pre-emptive frameworks, the article contributes not only to the discourse on smart cities but also to the practical considerations involved in their implementation. It goes beyond theoretical discussions to emphasize the need for meticulous planning and infrastructure development. The proposed approach aligns with the complexities inherent in PPP models, ensuring that the symbiosis between public and private sectors is orchestrated harmoniously for the

sustained success of Dubai's smart city initiative. The article concludes that Dubai has invested heavily in developing the legal, institutional, and supervisory frameworks essential for PPPs to deliver its smart city project successfully. The article urges the implementation of these frameworks before initiating any contractual arrangements and engagements in order to protect the interests of both the private and public sector entities that will be involved in this long-term project.

Conflict of interest: The authors declare no conflict of interest.

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