The Role of Public-Private Partnerships in Smart City Development: A South African Perspective

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1 ABSTRACT

Developing smart cities in South Africa is a transformative approach to address challenges such as rapid urbanisation, environmental sustainability, and economic development. This paper explores the role of Public-Private Partnerships (PPPs) in facilitating the development of smart cities, focusing on leveraging collaborative efforts between government entities and private sector stakeholders. The study uses a qualitative research approach, analysing case studies and policy frameworks, to highlight the potential of PPPs to mobilise resources, enhance technological capabilities, and foster innovation in smart city initiatives. The results emphasise the importance of innovation, public involvement, and strong PPP structures in advancing smart cities. The study concludes that effective governance, clear regulatory frameworks, and stakeholder engagement are critical factors in ensuring the success of PPPs in driving smart city development. The paper concludes with policy recommendations and strategic considerations for optimising the contributions of PPPs to South Africa's urban transformation agenda.

Keywords: PPP, Smart City Development, Urbanisation, Technical Advancements, South Africa

2 INTRODUCTION

The advent of the digital era has heralded a new paradigm in urban development, where cities are increasingly leveraging technology to enhance the quality of life, promote sustainable growth, and address complex urban challenges (Xihua and Goyal, 2022:190-195, Lynggaard and Skouby, 2016:1840, Lepekhin, et al., 2018:1029). Smart cities, characterised by integrating information and communication technologies (ICT) into urban infrastructure and services, have emerged as a strategic response to the demands of modern urbanisation (Lepekhin et al., 2018:1029). In South Africa, the pursuit of smart city development is seen as a pathway to technological advancement and a means to foster social inclusion, economic growth, and environmental sustainability (Cornelius, et al. , 2022:220-240). The primary aim of this study is to explore the role of Public-Private Partnerships (PPPs) in developing smart cities in South Africa. The objectives are to analyse the conceptual framework of PPPs, examine their dynamics in facilitating smart city development, identify the challenges and opportunities associated with their implementation, and provide policy recommendations for optimising their contributions to South Africa's urban transformation agenda.

The methodology of this study adopts a qualitative research approach, encompassing a comprehensive literature review, case study analysis, and semi-structured interviews with key stakeholders involved in smart city projects. The literature review provides a theoretical framework for understanding the dynamics of PPPs in smart city development. At the same time, the case studies offer insights into the practical application of PPPs in various urban settings. The semi-structured interviews with government officials, private sector representatives, and urban planners aim to gather firsthand perspectives on the role of PPPs in smart city initiatives, with thematic analysis used to identify recurring themes and patterns (Liu, et al. , 2021:138-156).

This research holds significance in multiple dimensions, contributing to the academic discourse on the intersection of PPPs and smart city development, providing practical insights for policymakers and urban planners, and offering lessons applicable to other emerging economies. The study is guided by research questions that seek to understand the conceptualisation of PPPs, the key factors influencing their success, the challenges faced in their implementation, and the policy implications for smart city development in South Africa. The findings are expected to inform strategies for sustainable urban development and enhance the efficacy of PPPs in transforming cities into smarter, more inclusive, and resilient urban environments.

The idea of cities, which involves using technology to improve infrastructure and services, is seen as a strategic response to the challenges of modern urbanisation. Private Partnerships (PPPs) play a role in

implementing smart city projects by promoting collaboration between public and private sectors to bring together resources, expertise and innovation. However, there is a need to understand how these partnerships can be structured and managed effectively in dealing with governance issues, risk management, and stakeholders' involvement in smart city contexts.

To address this knowledge gap, it is suggested that future research should focus on creating frameworks that guide the planning, execution and evaluation of PPPs in smart city ventures (Liu, et al. , 2021:138-156). These frameworks should consider the needs of city projects, such as technology integration and cybersecurity. Moreover, there is a call for studies to explore approaches to engaging stakeholders and evaluating the economic impacts of PPP-led smart city initiatives, particularly in countries like South Africa. (Selim and ElGohary, 2020:317-333) highlight the critical role of stakeholders in the success of PPPs in smart infrastructure projects. Understanding and analysing stakeholders' roles can mitigate opposition and ensure effective project implementation, bridging the gap in stakeholder expectations (Selim and ElGohary, 2020:317-333).

By tackling these gaps and making recommendations through research efforts, we can deepen our understanding of how PPPs contribute to the development of cities and offer practical advice for policymakers and professionals involved in such projects.

This involves recording and studying real-life examples from locations to discover methods and insights gained in implementing Public-Private Partnerships for creating lasting changes in urban areas.

3 LITERATURE REVIEW

A literature review critically analyses and synthesises existing research on a specific topic, offering an overview of the current state of knowledge, identifying gaps, and highlighting key findings. It contextualises the research problem within the existing body of knowledge, thus shaping the research question and justifying the study's significance. Additionally, the literature review provides insights into the theoretical and conceptual frameworks used in previous studies, as well as the methodologies employed, demonstrating the researcher's familiarity with the literature and contributing to scholarly conversations on the topic (Paez, 2017:233-240, Turner, 2018:113-117, Stratton, 2019:347-349, Uru, et al. , 2021:141-149, El-Farargy, 2016:1-12).

3.1 PPP-based theoretical models within the smart cities

Cities worldwide are increasingly utilising public-private partnerships (PPPs) to tackle challenges in smart city development. (Liu, et al. , 2021:138-156) found that PPPs help overcome budgetary constraints and conflicting stakeholder interests. (Mustaffa Kamal Effendee, et al. , 2021:1066) highlighted the importance of sustainable business models for funding allocation. (Khanjanasthiti, et al. , 2021:10624) discussed the global shift towards smart city concepts to address urban complexities. Fernandes (2021) highlighted the need for innovative solutions and technologies in the face of new challenges like the COVID-19 pandemic.

(Liu, et al. , 2021:138-156) and colleagues, in 2020, put forward a plan to incorporate partnerships (PPPs) into the development of smart cities. They focus on five areas: integrating technologies, enhancing risk assessment, boosting citizen involvement in sharing data, urban sustainability and streamlining processes. (Israilidis, et al. , 2021:101989) and team in 2021 explore knowledge management viewpoints while (Osu and Navarra, 2022:129-136) in 2022 present a framework for data governance. (Khanjanasthiti, et al. , 2021:10624) in 2021, examine the evolution of the Gold Coast into a city, emphasising aspects such as technology advancements, innovation centres, human resources development, and governing frameworks. These sources offer a roadmap for harnessing PPPs in smart city initiatives.

The Hong Kong example demonstrates how Private Partnerships (PPPs) play a role, in smart city projects, emphasising the importance of evaluating costs and benefits beforehand. The city's substantial government investments in technology (Ye, et al. , 2021:31-39). Further studies have explored Hong Kongs impact on enhancing tourism, its Smart City Blueprint and its involvement in establishing data centres. This case study sheds light on the varied aspects of city growth while stressing the significance of thorough evaluation and strategic planning (Sun, et al. , 2022:763-778, Ye, et al. , 2021:31-39).

Scholars highlighted a different form of service, namely health services, which involved an analysis of the impact of PPPs on effectiveness, equality, and the national economy (Bhatt, et al. , 2021:106-109). This

relationship was positive for the health sector in Turkey, as mentioned by (Erk, et al. , 2023:). All these studies in the cohort provide readers with clarity regarding the need for theoretical PPP models to develop smart cities in developing and underdeveloped countries (Erk, et al. , 2023:, Bhatt, et al. , 2021:106-109).

Developing cities relies on engaging residents and key stakeholders in gathering data to incorporate services and infrastructure efficiently. Platforms such as FixMyStreet and ClickFix play a role in improving infrastructure services. Collaboration, inclusivity, and solid institutional capacity are indispensable to fostering learning and revamping city infrastructure. The eco-efficiency of infrastructure is essential for rapidly growing cities. Involving the public in the planning and designing green infrastructure guarantees that community needs and preferences are considered. While integrating citizen feedback into policies poses a challenge, ensuring quality data and cybersecurity measures are in place is crucial, for successful execution. (Aljoufie and Tiwari, 2016:152-168, Ersoy, 2017:26-31)

Urban areas are being reshaped by cities that prioritise innovation and sustainability. They tackle housing and energy access issues while boosting city competitiveness and human resources (Nesti, 2019:289-304). Technology drives progress in environments (Scuotto, et al. , 2016:357-367). Smart cities should improve quality of life by utilising information and communication technologies, establishing governance models and fostering innovation. This approach goes beyond advancements to create public value, promote innovation, and ensure sustainability. Investing in infrastructure and knowledge sharing is crucial for involving residents in the planning and execution of city projects (Treude, 2021:769, Esposito, et al. , 2021:103329, Romanelli, 2020:2037-2052, Zeng, et al. , 2023:e0281862, Scuotto, et al. , 2016:357-367).

In areas it is essential for various groups such, as residents, businesses and academic institutions to work together to promote innovation and enhance the overall quality of life (Dezi, et al. , 2018:1247-1270). These joint efforts boost community involvement and tackle issues like transportation and eco-friendliness (Makieła, et al. , 2022:3516). The effectiveness of introducing technologies in cities dramatically depends on a blend of social and technological collaboration, ultimately leading to an improved quality of life for the residents (Radziszewska, 2022:957-945, Agbali, et al. , 2019:307-327, Giourka, et al. , 2019:4798).
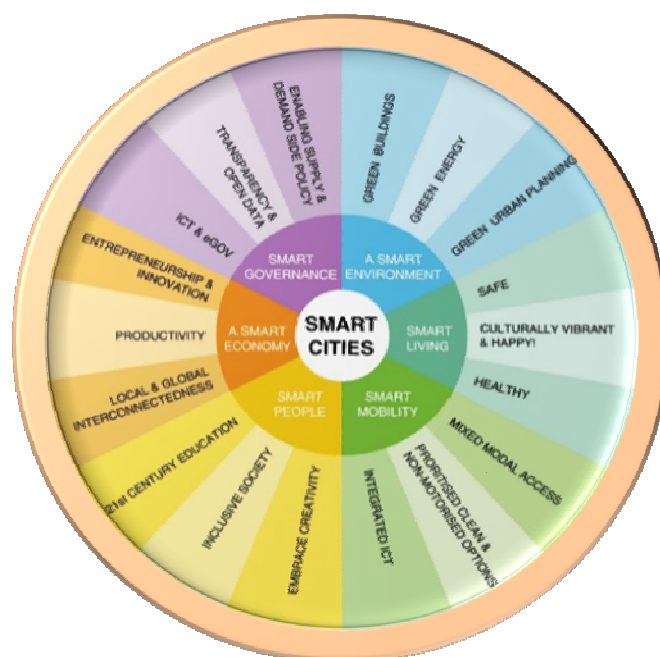

Figure 1 Examples of possible smart city elements and initiatives; Source: Giffinger et al., (2007)

To address these challenges and improve transparency and accountability in public-private partnerships, (Voorwinden, 2021:439-463) proposed a new approach that involved the production of recommendations and suggestions based on key performance indicators (KPIs), similar to the study by Awuah (2023) (Sheppard and Beck, 2022:843-861). These studies underscore the significance of engaging residents, addressing the challenges of integrating technologies in smart cities and promoting stakeholder collaboration (Voorwinden, 2021:439-463). Given the complex nature of public-private cooperation in smart cities, it is essential to conduct extensive research and develop a framework that effectively addresses issues related to

accountability and transparency (Liu, et al. , 2021:138-156, Khan, et al. , 2020:1507-1518, Voorwinden, 2021:439-463).

Smart cities combine various smart components that include, for instance, infrastructure elements. (Giffinger, et al., 2007:) identify the following areas: economy, people, governance, mobility, living and environment. Examples of possible smart initiatives that could be implemented in support of each of these areas are illustrated in Figure 1 below:

3.2 Smart City Projects Operating in South Africa

South Africa's President Ramaphosa introduced a plan for developing smart cities in 2019, focusing on sustainability, ICT infrastructure, and economic development (March and Naidoo, 2021:). This initiative aligns with the global trend towards smart city development, where Information and Communication Technology (ICT) plays a crucial role in enhancing urban sustainability and economic growth (Abed elhamed and Marzouk, 2019:78-95).

The smart city of Lanseria is under construction, aligning with the prior aim of using technology to improve living conditions. Implementing these strategies requires effective decision-making and efficient use of public-private partnerships (PPPs).

Only 22% of 167 cities worldwide have been leaders in developing smart cities. Ekurhuleni has emerged as an advanced city, making significant progress. The process of developing smart cities in South Africa has been complex, with challenges such as poverty, inequality, high implementation costs, security risks, regulatory deficiencies, and a shortage of required skills and labour (Enwereji and Uwizeyimana, 2022:93-109, Mokoena, et al. , 2019:1327-1332).

To address these challenges, the Department of Science and Innovation and the Academy of Science of South Africa recommend using PPPs to achieve inclusivity and innovation. However, there is a general lack of data maturity in South Africa, hindering smart governance and development initiatives (March and Naidoo, 2021).

Category and characteristics	South African cities
Technological Urban information management (internal and external) Information generation, capture and processing Data archiving, curation and storage Dissemination and discovery	A significant obstacle in South Africa is the absence of centralised and integrated data management systems across all municipal agencies, hindering the collection and reporting of data. Although these instances occasionally occur in many businesses, they are often utilised independently and in formats unique to each company, making them non-transferable. Furthermore, there is a notable absence of the necessary capacity and competence to do this task, with data champions being rare, if they exist. The eThekwini Municipality has just designated a Chief Digitisation Officer.
Methodological Data preparation: information retrieval and extraction, data linkage/information integration, data cleaning, anonymisation, quality assessment and credibility Urban analysis: methods for data-rich urban modelling and data-driven modelling; ascertaining uncertainty, biases, and error propagation	The specific delineation and prioritisation of IT soft and hard infrastructure, systems, and data strategies are lacking within and between departments. Urban areas suffer from a shortage of skilled professionals, such as statisticians and personnel, who can assess the trustworthiness and accuracy of data. Inaccurate and inconsistent data arises from several reporting platforms for many city agencies. Municipalities employ varied methodologies for data gathering, leading to inconsistent coverage across different data indicators.
Theoretical Understanding metrics, definitions, concepts, and changing ideologies and methods to understand "urban" Evaluating the soundness of methodologies and boundaries of knowledge Exploring the relationship between future cities, sustainability, and social justice.	South African cities lack a unified theoretical framework. The absence of information on the data gathered from various departments and the specific metrics employed by each agency necessitates acquiring data from private data providers, albeit at a financial expense.

Table 1 Key data challenges for cities. Source: Thakuriah (2017)

(Sanni and Hashim, 2014:133-138) emphasise the significance of public-private partnerships (PPPs) in South Africa's development of smart cities, drawing from successful PPP implementations is Singapore and South Korea (Kim, S. and Choi, 2023:142-155). They highlight the role of PPPs in mobilising funds and fostering innovation.

3.3 Examples of PPPs in South Africa

Public-Private Partnerships (PPPs) have been instrumental in advancing South Africa's infrastructure across various sectors. In healthcare, PPPs have facilitated the development of hospitals, ensuring efficient management and quality services. The transport and roads sector has improved through PPPs in road construction, maintenance, and toll management, enhancing connectivity and reducing congestion. The tourism industry benefits from PPPs in the development of attractions and accommodations, promoting growth and sustainability (Suryan, et al. , 2020:15-23, Seeletse, 2016:19, Nkhoma and Agbenyegah, 2021:799-817, Sinkala, et al. , 2022:152-183).

In addition to healthcare and transport, PPPs are utilised to construct and manage office spaces for government entities, optimising costs and efficiency. Equity partnerships in infrastructure projects foster shared investment, risks, and rewards, contributing to sustainable development. Facilities management projects extend the role of PPPs beyond construction, with private partners handling maintenance and operational tasks, enabling the public sector to focus on service delivery (Hellowell, 2019:e001217, Osei-Kyei, et al. , 2017:2092-2112, Kim, K., et al. , 2021:3311).

Notable PPP projects in South Africa include the Gautrain Rapid Rail Link, connecting critical urban areas, and the Nelson Mandela Bay Stadium, a multipurpose venue developed for the 2010 FIFA World Cup (Worku, 2020:259-268). The Bloemfontein Courthouse and the Lesotho Highlands Water Project highlight PPPs in judicial infrastructure and cross-border water supply, respectively (Worku, 2020:259-268). The expansion of the Durban Container Terminal and the development of the Cape Town International Convention Centre demonstrate the impact of PPPs on port efficiency and international convention hosting (Worku, 2020:259-268). These examples underscore PPPs' diverse applications and benefits in South Africa's development landscape.

4 METHODOLOGY

The researcher in question employed an interpretive research philosophy in conjunction with a unique descriptive content-analysis-based design as the primary research design for the study (Goel, 2023:3858-3875). This approach is commonly used in social science research (Malik and Gupta, 2022:). Interpretive research philosophy is known for its emphasis on understanding social reality through philosophical and methodological means (Botlhale, 2022:115-137). It assists in exploring the reality of the subjects involved in the research by explaining their intentions and actions (Zehra, 2016:). The study also adopted the inductive and qualitative case study research methods, aiming to extend theoretical insights into the information technology implementation literature (Utulu and Ngwenyama, 2021:1322-1340).

For data collection, the researcher relied on secondary reliable sources such as journals and case studies obtained from the Internet, which served as the primary methodological approach for the paper. This methodological choice aligns with interpretive analysis to clarify descriptive analysis through theory and previous research selected after performing the descriptive analysis (Pham, 2022:261-273).

Furthermore, the utilisation of interpretive phenomenological research methods was highlighted in the references. Researchers have claimed to use interpretive phenomenological methods in social science research, emphasising the need for a non-biased attitude by bracketing any preconceived beliefs (Singsuriya, 2015:348-358). Additionally, modifications of Ricoeur's hermeneutic phenomenology have been developed by nursing researchers, showcasing the evolution and sharing of interpretive methods within the research community.

In conclusion, integrating interpretive philosophy with a descriptive content-analysis-based design and reliance on secondary sources for data collection reflects a comprehensive and systematic approach to conducting the study, aligning with established practices in social science research.

5 RESULTS

Public-Private Partnerships (PPPs) are essential in developing smart cities in South Africa, addressing challenges and achieving innovative objectives. Critical themes for successful smart city projects include integrating technologies, addressing concerns, engaging residents, sharing data, and streamlining processes. Research on Hong Kong and Turkey highlights the importance of evaluating costs and benefits and the positive correlation between PPPs and factors like economy, equality, and effectiveness.

Research on smart city initiatives emphasises the need for collaboration among diverse stakeholders, such as citizens, industries, and research centres. The South African President's vision for developing smart cities prioritises sustainability, economic development, and ICT infrastructure to improve the quality of life. Collaboration with stakeholders is essential for success.

However, challenges such as lack of skills, regulatory uncertainty, security risks, and high implementation costs necessitate using PPPs to mitigate these barriers and achieve innovation. Innovative approaches to utilising PPP models, such as integrating blockchain and artificial intelligence, can enhance transparency and accountability. Citizens' active participation in decision-making processes is crucial for the success of smart city projects. Robust PPP frameworks are essential for achieving the development and growth of smart cities.

6 DISCUSSION

The present study examines the role of public-private partnerships (PPPs) in the critical development of smart cities in South Africa. Investigating theoretical models within smart city initiatives highlights the importance of cooperation between public and private entities. The study identifies PPP aspects, such as technology integration, risk profiling, and resident engagement, as essential in laying the groundwork for stakeholder involvement.

The research case studies and national development records illustrate the significance of PPPs in addressing challenges and achieving efficient smart city development, from infrastructure projects to hospital services. Stakeholders are advised to employ PPP themes to design a framework that promotes innovation, sustainability, and inclusivity in smart city development projects. Local governments or rule-makers can refer to the successes and limitations identified through the researcher's literary analysis.

There is a pressing need to adopt an approach that can effectively address these challenges. Future studies are recommended to explore regulatory bodies' concerns, investigate innovative technologies, and refine theoretical models to enhance smart city strategies. Adopting a citizen-centric approach can be effective in achieving sustainability and technological advancement. The researcher's recommendations can help mitigate concerns and focus on opportunities that can leverage PPPs for efficient smart city development in South Africa.

7 CONCLUSION

This paper aimed to provide insights regarding the role of PPP from a South African perspective. There is rapid urbanisation in South Africa, just like in many other parts of the world. These have created several challenges, as a result, smart cities have been developed to address these concerns, particularly in South Africa, where they aim to utilise smart technology to address the problems of municipalities.

Acknowledging that these enhancements come with a high price tag is essential. Therefore, private companies should allocate their resources towards improving public urban infrastructure, which lacks effectiveness and sufficient public funding. Several writers have highlighted the significance of utilising public-private partnerships (PPPs) in advancing smart cities in South Africa.

They have drawn on previous experiences and lessons acquired from the successful implementation of PPPs in countries like the UK, Australia, Singapore, and India. PPPs have been strongly emphasised in South Africa to mobilise funds and foster innovation. Several smart city initiatives have been carried out in South African cities, and all of these experiences underscore the significance of PPPs in overcoming existing challenges and developing smart cities.

8 REFERENCES

Abed elhamed, H. & Marzouk, A. (2019). Impact of ICT on urban plannning and development management - the case of water resources sector. Journal of urban research, 34(1):78-95.

Agbali, M., Trillo, C., Ibrahim, I.A., Arayici, Y. & Fernando, T. (2019). Are smart innovation ecosystems really seeking to meet citizens' needs? insights from the stakeholders' vision on smart city strategy implementation. Smart cities (basel), 2(2):307-327.

Aljoufie, M. & Tiwari, A. (2016). Measuring intra-city eco-efficiency variations of urban infrastructures in jeddah. American journal of environmental sciences, 12(3):152-168.

Bhatt, L.D., Shrestha, R. & Bhandari, V.P. (2021). The public-private partnership (PPP) initiative in healthcare system: As the pathways to achieve the SDGs in nepal. Europasian journal of medical sciences, 3(2):106-109.

Botlhale, E. (2022). Sustainable financing for human resource development in botswana. Africa review (new delhi), 15(2):115-137.

Cornelius, F.P., Jansen van Rensburg, S.K. & Kader, S. (2022). The value of criminological theories in explaining cybersecurity in south african smart cities. Annales internationales de criminologie, 60(2):220-240.

Dezi, L., Pisano, P., Pironti, M. & Papa, A. (2018). Unpacking open innovation neighborhoods: Le milieu of the lean smart city. Management decision, 56(6):1247-1270.

El-Farargy, N. (2016). Educational research: Reviewing the literature. New directions in the teaching of physical sciences (online), (8):1-12.

Enwereji, P.C. & Uwizeyimana, D. (2022). Smart city readiness in south african municipalities: A qualitative study. Holistica : Journal of business and public administration, 13(1):93-109.

Erk, E.Y., Budayan, C., Koc, K. & Tokdemir, O.B. (2023). Value creation in PPP projects undertaken in the turkish healthcare industry. Journal of construction engineering and management, 149(11):.

Ersoy, A. (2017). Smart cities as a mechanism towards a broader understanding of infrastructure interdependencies. Regional studies, regional science, 4(1):26-31.

Esposito, G., Clement, J., Mora, L. & Crutzen, N. (2021). One size does not fit all: Framing smart city policy narratives within regional socio-economic contexts in brussels and wallonia. Cities, 118103329.

Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N. & Meijers, E.J. (2007). Smart cities. ranking of european medium-sized cities. final report.

Giourka, P., Sanders, M., Angelakoglou, K., Pramangioulis, D., Nikolopoulos, N., Rakopoulos, D., Tryferidis, A. & Tzovaras, D. (2019). The smart city business model Canvas—A smart city business modeling framework and practical tool. Energies (basel), 12(24):4798.

Goel, A. (2023). Using secondary data in research on social sustainability in construction project management: A transition from "interview society" to "project-as-practice". Engineering, construction, and architectural management, 30(9):3858-3875.

Hellowell, M. (2019). Are public–private partnerships the future of healthcare delivery in sub-saharan africa? lessons from lesotho. BMJ global health, 4(2):e001217.

Israilidis, J., Odusanya, K. & Mazhar, M.U. (2021). Exploring knowledge management perspectives in smart city research: A review and future research agenda. International journal of information management, 56101989.

Khan, H.H., Malik, M.N., Zafar, R., Goni, F.A., Chofreh, A.G., Klemeš, J.J. & Alotaibi, Y. (2020). Challenges for sustainable smart city development: A conceptual framework. Sustainable development (bradford, west yorkshire, england), 28(5):1507-1518.

Khanjanasthiti, I., Chandrasekar, K.S. & Bajracharya, B. (2021). Making the gold coast a smart City—An analysis. Sustainability (basel, switzerland), 13(19):10624.

Kim, K., Kim, J. & Yook, D. (2021). Analysis of features affecting contracted rate of return of korean PPP projects. Sustainability (basel, switzerland), 13(6):3311.

Kim, S. & Choi, Y. (2023). A comparative study of the adoption of public-private partnerships for water services in south korea and singapore. Public administration and policy, 26(2):142-155.

Lepekhin, A., Borremans, A. & Iliashenko, O. (2018). Design and implementation of IT services as part of the "Smart city" concept. MATEC web of conferences, 1701029.

Liu, T., Mostafa, S., Mohamed, S. & Nguyen, T.S. (2021). Emerging themes of public-private partnership application in developing smart city projects: A conceptual framework. Built environment project and asset management, 11(1):138-156.

Lynggaard, P. & Skouby, K.E. (2016). Complex IoT systems as enablers for smart homes in a smart city vision. Sensors (basel, switzerland), 16(11):1840.

Makieła, Z.J., Stuss, M.M., Mucha-Kuś, K., Kinelski, G., Budziński, M. & Michałek, J. (2022). Smart city 4.0: Sustainable urban development in the metropolis GZM. Sustainability (basel, switzerland), 14(6):3516.

Malik, S. & Gupta, D.S.K. (2022). The importance of text mining for services management. TechnoareteTransactions on intelligent data mining and knowledge discovery, 2(4):.

March,©. & Naidoo,K. (2021). A SOUTH AFRICAN SMART CITIES FRAMEWORK A decision-making framework to guide the development of smart cities in South Africa.

Mokoena, B.T., Moyo, T., Makoni, E.N. & Musakwa, W. (2019). Spatio-temporal modelling & the new urban agenda in post-apartheid south africa. International archives of the photogrammetry, remote sensing and spatial information sciences., XLII-2/W131327-1332.

Mustaffa Kamal Effendee, E.F., Dorasamy, M., Bin Ahmad, A.A., Aris, A., Harguem, S. & Kaliannan, M. (2021). Sustainable business model for local council's smart city initiatives: A systematic literature review [version 1; peer review: 1 approved with reservations]. F1000 research, 101066.

Nesti, G. (2019). Mainstreaming gender equality in smart cities: Theoretical, methodological and empirical challenges. Information polity, 24(3):289-304.

Nkhoma, M.T.K. & Agbenyegah, A.T. (2021). Enhancing border security through public-private partnerships in south africa. International journal of innovation, creativity and change, 799-817.

Osei-Kyei, R., Chan, A.P.C. & Ameyaw, E.E. (2017). A fuzzy synthetic evaluation analysis of operational management critical success factors for public-private partnership infrastructure projects. Benchmarking : An international journal, 24(7):2092-2112.

Osu, T. & Navarra, D. (2022). Development of a data governance framework for smart cities. International archives of the photogrammetry, remote sensing and spatial information sciences., XLVIII-4/W5-2022129-136.

Paez, A. (2017). Gray literature: An important resource in systematic reviews. Journal of evidence-based medicine, 10(3):233-240.

Pham, S.T. (2022). The distinctions of heideggerian phenomenological research method. Qualitative research journal, 22(2):261-273.

Radziszewska, A. (2022). Crowdsourcing as an open innovation strategy in knowledge-based smart city management. European conference on knowledge management, 23(2):957-945.

Romanelli, M. (2020). Analysing the role of information technology towards sustainable cities living. Kybernetes, 49(7):2037-2052.

Sanni, A.O. & Hashim, M. (2014). aBuilding infrastructure through public private partnerships in sub-saharan africa: Lessons from south africa. Procedia, social and behavioral sciences, 143133-138.

Scuotto, V., Ferraris, A. & Bresciani, S. (2016). Internet of things: Applications and challenges in smart cities: A case study of IBM smart city projects. Business process management journal, 22(2):357-367.

Seeletse (2016). Performance of South African private-public partnershipsLLC CPC Business Perspectives. Pages 19.

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.

Sheppard, G. & Beck, M. (2022). Stakeholder engagement and the future of irish public–private partnerships. International review of administrative sciences, 88(3):843-861.

Singsuriya, P. (2015). Nursing researchers' modifications of ricoeur's hermeneutic phenomenology. Nursing inquiry, 22(4):348-358.

Sinkala, A., Ochieng, E., Ominde, D., Zuofa, T. & Badi, S. (2022). Reimaging public-private partnership model as hybrid: South africa viewpoint. Public works management & policy, 27(2):152-183.

Stratton, S.J. (2019). Literature reviews: Methods and applications. Prehospital and disaster medicine, 34(4):347-349.

Sun, S., Ye, H., Law, R. & Hsu, A.Y. (2022). Hindrances to smart tourism development. Journal of hospitality and tourism technology, 13(4):763-778.

Suryan, V., Persadanta, P., Alddi, M.D.B. & Putri, J. (2020). The adoption of public-private partnership concessions for a development project in emerging economies. Journal of airport engineering technology, 1(1):15-23.

Treude, M. (2021). Sustainable smart City—Opening a black box. Sustainability (basel, switzerland), 13(2):769.

Turner, J.R. (2018). Literature review. Performance improvement quarterly, 31(2):113-117.

Uru, O.B., Sudirman, A. & Nugroho, A.D. (2021). Exploring cohesions in EFL academic writing: A state of the art on the study of cohesions. Elsya (online), 3(2):141-149.

Utulu, S.C.A. & Ngwenyama, O. (2021). Multilevel analysis of factors affecting open-access institutional repository implementation in nigerian universities. Online information review, 45(7):1322-1340.

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

Worku, Z. (2020). The strategic benefits of rehabilitation of the prison population of the city of tshwane. Journal of applied business research, 36(6):259-268.

Xihua, Z. & Goyal, D.S.B. (2022). Security and privacy challenges using IoT-blockchain technology in a smart city: Critical analysis. International journal of electrical and electronics research, 10(2):190-195.

Ye, H., Zhang, K. & Law, R. (2021). A framework of implications for smart tourism development in hong kong. Journal of smart tourism, 1(1):31-39.

Zehra, N. (2016). Training & development barometer for effective transformation of organizational commitment and overall performance in banking sectors of KPK, pakistan: Qualitative study of workforce of bank of khyber. International journal of academic research in business and social sciences, 6(6):.

Zeng, Y., Zhang, Z., Ye, Z. & Li, L. (2023). Regional innovation effect of smart city construction in china. PloS one, 18(2):e0281862.