



## PUBLIC AWARENESS AND PERCEPTION OF THE SMART CITY CONCEPT IN KUWAIT: EVALUATING ITS SIX KEY DIMENSIONS

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### ABSTRACT

Aim/Purpose	This study explored public perceptions of the smart city concept in Kuwait and assessed their understanding of its features and dimensions.
Background	Over the past decade, the notion of “smart cities” has gained significant traction, with numerous urban areas eager to embrace this digital evolution. For a city to transition into a smart city, it must develop a service strategy that places the public as the primary beneficiary of the smart city services.
Methodology	The study employed the Smart City Wheel model, encompassing six key dimensions of a smart city: governance, mobility, people, economy, living, and environment. The ‘smartness’ of a city is assessed based on the level of advancement in these six key dimensions. To achieve the study’s objectives, 434 individuals were surveyed quantitatively.
Contribution	Existing studies highlight growing awareness of smart cities and the impact of visibility and demographics but often lack analysis of public perceptions of specific technologies. This study bridges that gap by examining public awareness and perceptions of Smart Cities in Kuwait.
Findings	The results revealed that just under half of the participants had some understanding of Smart Cities, reflecting moderate community awareness. More than a third of those aware believe their city is working towards becoming smart. However, over half of the respondents are unaware of the concept, indicating a significant knowledge gap. Among the unaware, more than a quarter think local

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authorities have made efforts to inform the public. Despite this, over three-quarters are interested in learning about Smart Cities, and two-thirds want to engage in city development decisions through digital platforms, demonstrating a potential for public involvement in smart city initiatives. Respondents strongly associate the six key dimensions with the Smart City concept, ranking their importance as follows: smart governance, smart mobility, smart environment, smart living, smart economy, and smart people. The most frequent activities were observed in smart people, smart economy, and smart living. Improvement needs are diverse, with frequent calls for enhancement in smart environment, smart living, and smart mobility. The results also reveal notable variations in the perceived importance of the dimensions and their correlations with the Smart City concept based on employment status, age, and education.

Future Research	Future research should explore alternative models and dimensions to provide a more comprehensive understanding of smart cities. To enhance the generalizability of the findings, a larger-scale survey conducted over a more comprehensive geographical range would be beneficial.
Keywords	perceptions, smart cities, sustainability, civic engagement, stakeholders, smart economy, smart mobility, smart people, smart governance, smart living, smart environment, Kuwait

## INTRODUCTION

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The notion of a “Smart City” is the first stride towards achieving sustainable development; it aims to modernise urban living by implementing state-of-the-art technologies. The focal point of any smart city’s service plan should be the citizens who derive the most significant benefit from the goods and services offered by the city (Georgiadis et al., 2021). A “smart city” is a settlement that achieves its goals by employing state-of-the-art technological solutions. Potential goals include financial development, education, poverty eradication, and social equality (Georgiadis et al., 2021). The prioritisation of ICT is crucial for a smart city to enhance its connectivity with its inhabitants and external environments (Albino et al., 2015). Several software solutions can contribute to the development of smart cities (Christodoulou et al., 2018). Nevertheless, the responsibility for using technology in “smart” ways lies with the politicians, residents, and local administration (Berntzen & Johannessen, 2016). The advent of new modes of communication and connection has significantly expanded the opportunities available to citizens to engage in urban life. The development of smart cities depends on inhabitants’ active participation, ideas, and perspectives. To achieve intelligence, cities should prioritise delivering services that are advantageous to their residents (Georgiadis et al., 2021). The urban population currently comprises over 50% of the global population, with projections indicating a progressive rise to over 70% by the year 2050 (Staletić et al., 2020). Approximately 68% of the global population will reside in urban areas by 2050 (Pirlone et al., 2020). These circumstances could potentially give rise to significant difficulties, such as environmental contamination, traffic congestion, and insufficient resource availability (Feng et al., 2020).

Kuwait is ambitiously striving to construct smart cities to improve its urban infrastructure and boost the quality of life for its residents. One notable instance of this endeavour is the South Saad Al Abdullah project, which aims to become Kuwait’s inaugural smart city by 2025. This effort seeks to act as a paradigm for incorporating intelligent technologies in several industries and tackling issues related to urban development (Alghais & Ali, 2023). The city is specifically purpose-built to integrate cutting-edge technology like Geographic Information Systems (GIS) to enhance energy efficiency, traffic control, air quality monitoring, and environmental management (Alghais & Ali, 2023). Despite these improvements, obstacles remain in attaining smooth integration of automated and monitoring

systems with enhanced coordination technologies. Kuwait has leveraged state-of-the-art technology, such as blockchain, to improve governance, public service delivery in its smart cities, and infrastructure improvements. Blockchain technology has substantial advantages, such as enhanced visibility, safety, and effectiveness in overseeing municipal services, ranging from medical data to urban planning. According to Alkhaldi et al. (2025), incorporating blockchain technology into smart city frameworks is anticipated to increase the effectiveness of the digital ecosystem, thereby facilitating improved decision-making and governance. According to Saxena and Altamimi (2018), Kuwait's emphasis on digital infrastructure and smart technologies establishes it as a frontrunner in digital transformation among Gulf Cooperation Council (GCC) countries. It helps to decrease its reliance on oil. Furthermore, incorporating intelligent technologies goes beyond infrastructure into the educational system, guaranteeing that future generations gain sophisticated digital skills and tailored learning experiences. This strategy is crucial for Kuwait's knowledge-driven economic development and helps to achieve its comprehensive smart city concept (Almutairi et al., 2022). Kuwait's smart city projects highlight a complete infrastructure, government, and education plan. This comprehensive strategy establishes Kuwait as a regional innovation and sustainable urban development frontrunner.

Over the last decade, the notion of "smart cities" has gained significant traction, and numerous cities aspire to engage in this digital metamorphosis of their neighborhoods. An urban area aspiring to achieve smart status must have a service strategy that places the public as the primary beneficiaries of the services offered by a smart city. Integrating citizen feedback into smart city design is crucial for addressing real needs and ensuring effective urban management. The literature suggests that public perception and participation are increasingly vital for successful projects (Gohari et al., 2020; Tadili & Fasly, 2022). People's perceptions play a vital role in the success and implementation of smart city initiatives. Thus, studying how people see smart cities will help us better understand public acceptability, interest, participation, and potential impediments and barriers.

In this regard, the concept of smart cities is perceived differently across various communities, with many people still having a vague or incomplete understanding despite the term's growing popularity. Recent surveys, such as those by Chichernea (2015), De Filippi et al. (2019), and the International Data Corporation (2023), show that awareness is increasing, particularly in cities with active smart city projects. However, comprehensive knowledge about smart cities' specific technologies and benefits remains limited (Smart et al., 2023; Williams et al., 2022). Studies by Rodriguez and Lee (2023) and Y. Zhang et al. (2023) highlight that the understanding of technologies like IoT and AI is insufficient, though the visibility of smart city technologies, such as smart traffic systems, can enhance public comprehension (H. Liu et al., 2023; Turner et al., 2023).

Awareness also varies by demographics, with younger and more educated individuals generally having a better grasp (Pew Research Center, 2023) and regions with extensive media coverage showing higher familiarity (Patel & Nguyen, 2023). Ahmed and Raza (2023) emphasised that educational initiatives and community outreach are crucial for understanding smart city technologies. The literature on public perceptions of the Smart City Wheel's six dimensions reveals varying levels of awareness and attitudes shaped by local context, demographics, and the visibility of smart city initiatives. Perceptions of smart mobility and smart living are generally positive, as these dimensions offer direct benefits, such as enhanced traffic management and improved healthcare services (Mora et al., 2021; Yang et al., 2021). In contrast, understanding the smart economy and people is often limited, with many individuals not fully comprehending these dimensions' broader economic impacts and digital inclusion efforts (Gordon & Koo, 2021; Meijer & Bolívar, 2020). The smart environment dimension receives substantial support for its sustainability benefits, yet the specific technologies involved are often poorly understood (Albino et al., 2015; Gomez et al., 2019; Peštová, 2021). Smart governance is appreciated for improving service delivery, though it frequently falls short of addressing citizens' aspirations for greater empowerment in decision-making processes (Chourabi et al., 2021). Demographics significantly shape perceptions, with younger and more educated individuals generally demonstrating greater engagement.

In Kuwait, awareness and understanding of the smart city concept are developing but still limited. Although the term “smart city” is gaining recognition due to various government and private sector initiatives, the general public’s grasp of the specific technologies and their benefits remains superficial (Al-Mutairi et al., 2023). The visibility of smart city projects, such as smart traffic systems and energy-efficient buildings, is improving public awareness, particularly in urban areas (Al-Khalifa et al., 2023). However, outside major cities, familiarity with these technologies is still low. Demographic factors also influence awareness, with younger and more educated individuals showing a better understanding (Kuwait Institute for Scientific Research, 2023). Public perceptions of the Smart City dimensions are developing, with greater awareness in urban areas but limited understanding of the underlying technologies. Dimensions like smart mobility and smart living are more positively received due to visible improvements in traffic systems and quality of life, especially in cities (Al-Khalifa et al., 2023). However, the smart economy and smart people face challenges, with many unaware of the benefits of smart technologies’ broader economic and digital literacy (Kuwait Institute for Scientific Research, 2023). Outside major cities, familiarity with smart city initiatives remains low, and demographic factors like age and education significantly influence public awareness (Al-Mutairi et al., 2023).

While existing studies offer valuable insights into the growing awareness of smart cities and the impact of visibility and demographics, they often lack a thorough analysis of how the public perceives specific Smart City technologies and dimensions. There is a need for a more detailed examination of the relationships between Smart City dimensions and public perceptions. This study addresses that gap by providing an in-depth look at public awareness and perceptions of the Smart City concept in Kuwait. Unlike previous research, which generally covers awareness and visibility, this study assesses how the six key Smart City dimensions are viewed in terms of their importance, visibility, and areas for improvement. It also explores how these perceptions vary by demographic factors, offering a more detailed understanding of public engagement with each dimension. This approach provides targeted insights to enhance educational and outreach strategies effectively.

This study, therefore, explored public perceptions of the smart city concept in Kuwait and assessed their understanding of its features and dimensions. The study used Giffinger et al.’s (2007) model, later expanded by Cohen (2014), which includes six dimensions of a smart city: governance, mobility, people, economy, living, and environment. The ‘smartness’ of a city is assessed based on the level of advancement in these six key dimensions.

The remainder of the paper is structured as follows. The next section presents the literature review, followed by the theoretical model, research questions, method, findings, and discussion. The final sections address limitations and future research, conclusions, implications, and recommendations.

## LITERATURE REVIEW

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### *AN OVERVIEW*

The earlier literature on smart cities dates back to the 1980s and is closely linked to the advancement of ICTs (Jonek-Kowalska & Wolniak, 2021). Studies on smart cities have focused on three domains: human-centric, techno-centric, and policy agenda approaches (Borghys et al., 2020; Calzada, 2020; Cambra-Fierro & Pérez, 2022; Nieto & Brosei, 2019; Oliveira et al., 2020; Ribeiro et al., 2021; Stojanova et al., 2021; Wirtz & Müller, 2022). As a result, ICTs can potentially boost smart cities’ social and economic growth while encouraging innovation. Recent research emphasises the importance of smart cities across both developed and developing countries, focusing on how citizens perceive and benefit from smart city services. Studies have highlighted various aspects such as social, environmental, and community integrations and their effects on quality of life, including well-being and reduced issues like violence, pollution, and unemployment (Ahvenniemi et al., 2017; Anastasiou et al., 2021; Bekkar et al., 2021; Carvalho et al., 2019; Dameri & Ricciardi, 2015; Ferro De Guimarães et al., 2020; Ji et al., 2021; Macke et al., 2018; McGuire et al., 2022; Mun Chye et al., 2022; Vázquez et al., 2018; Visvivy et al., 2019; Wei et al., 2018). Macke et al. (2018) noted dissatisfaction with smart cities

in Southern Brazil and stressed the need for urban planners to align quality-of-life measures with local expectations. Mutambik (2023) found that GCC citizens recognised both the benefits and drawbacks of smart cities, particularly concerning technology reliance, privacy, and dehumanisation. Similarly, Sepasgozar et al. (2019) employed a citizen-centric approach in developing cities like Iran and Bangladesh, while AlAli et al. (2023) revealed positive attitudes and privacy concerns among Qatari citizens towards smart cities. Hamamurad et al. (2022) identified key factors influencing citizens' use of smart city services in Malaysia, such as security and trust. Other studies have also addressed similar concerns (Corbett & Le Dantec, 2021; Dickens et al., 2019; Dickinson et al., 2019; Y. Wang et al., 2019; Whitney et al., 2021).

Research underscores the importance of local, people-centric approaches in smart city development (Ji et al., 2021; Lee & Lee, 2014). Cambra-Fierro and Pérez (2022), Makki and Alqahtani (2024), Khan et al. (2019) discussed challenges and barriers in rural-urban development, while Vidiasova et al. (2019) and Trutnev and Vidiasova (2019) highlighted a lack of smart city trust and awareness as a barrier. Georgiadis et al. (2021) noted better knowledge of smart city applications in Cyprus than in Greece but also identified a lack of public-private partnerships as a challenge. Further, studies by Vidiasova and Cronemberger (2020), Simonofski et al. (2021), Gohari et al. (2020), Choo et al. (2023), Spicer et al. (2023), Remr (2023), and Caputo et al. (2023) emphasise the need for localised, citizen-focused smart city projects, advocating for broader community and private sector engagement. Civic engagement is critical for smart city innovation and development (Remr, 2023; van Twist et al., 2023). Caputo et al. (2023) highlighted how Italian citizen involvement can drive sustainable development through digital technologies.

### ***UNDERSTANDING SMART CITIES: KEY MODELS AND FRAMEWORKS***

A summary of the theoretical frameworks and models developed to study Smart City initiatives is included in Table 1. The specific features of the smart city being evaluated determine each model's role. The Smart City Wheel architectural models provide a holistic view of the numerous components of a smart city. The city is divided into several sections in these models: the environment, people-centric, governance, economy, and mobility. This allows planners to thoroughly evaluate the many capabilities and constraints of urban development areas, ensuring that no detail is left out when satisfying the varying needs of city dwellers. To address the varied needs of residents by the UN's sustainable development goals (SDGs) for reducing environmental impacts, alternative models like the Smart Sustainable City Model and IBM Smart City Framework rely heavily on collected data and technological infrastructure. Transportation, public safety, utility, and resource management decision-making are all enhanced by this method's use of real-time data. It makes these areas more sustainable and able to meet inhabitants' needs by optimising resource allocation, increasing efficiency, and decreasing waste.

The Triple Helix (Etzkowitz & Leydesdorff, 1995) and the Quadruple Helix (Carayannis & Campbell, 2009) are two examples of knowledge-based and innovative models. To build innovative and knowledge-based economies, foster public-private partnerships, and ensure the long-term viability of smart cities, these models stress the importance of collaboration among various sectors, stakeholders, businesses, institutions, and societies. Communities are better prepared to endure economic and environmental shocks using approaches like the Resilient Communities Framework (Arup International Development, 2014; Desouza & Flanery, 2013; Hynes et al., 2020). By concentrating on infrastructure development, leadership, and well-being, cities are helped to create policies that successfully react to social challenges, climate change, and natural disasters. The E-Governance Model, on the other hand, emphasises delivering public services through digital governance (Balaji, 2025; Heeks, 2001). The goal of developing these models was to provide cities with valuable tools for building smarter, more efficient, and more resilient cities by addressing specific challenges and attaining specific goals.

**Table 1. Models and frameworks developed to study Smart City initiatives**

Model/ framework	Description	Key dimensions	Typical uses
Smart City Wheel (Cohen, 2014; Giffinger et al., 2007)	It organises smart city attributes into six key dimensions and evaluates city performance. It is widely used to rank smart cities, especially in Europe.	Smart Economy, Smart People, Smart Governance, Smart Mobility, Smart Environment, Smart Living	They are used in global benchmarking and measuring smart city attributes for urban planning. They are applied in European cities like Vienna for smart city evaluation and ranking.
IBM Smart City Framework	Emphasises data and automation to enhance urban functions across five key sectors.	Smart Transportation, Smart Utilities, Smart Public Safety, Smart Healthcare, Smart Buildings	It is implemented in IBM's Smarter Cities Challenge to improve city management through data and analytics.
Smart Sustainable City Model (International Telecommunication Union, 2015)	A sustainability-focused framework aligns smart cities with the UN's Sustainable Development Goals (SDGs).	Technology, Economy, Society, Environment	They are used by cities aiming to meet global sustainability targets and improve energy efficiency and resource management.
Smart City Maturity Model (Aragão et al., 2023)	Tracks the maturity levels of cities transitioning to smart environments.	Governance, Urban Mobility, ICT Infrastructure, Sustainability, Economy, People	Applied to assess city progress from basic technological infrastructure to fully integrated smart systems.
Triple Helix Model (Etzkowitz & Leydesdorff, 1995)	It focuses on innovation through collaboration between the university, industry, and government sectors.	University, Industry, Government	They are used in research parks and innovation districts to foster urban innovation and growth.
Quadruple Helix Model (Carayannis & Campbell, 2009)	Expand on the Triple Helix Model by adding civil society to the collaboration process.	University, Industry, Government, Civil Society	They are used in cities focusing on citizen engagement and inclusive smart city development.
E-Governance Model (Balaji, 2025; Heeks, 2001)	It focuses on digital platforms that improve interaction between governments, citizens, and businesses.	Government to Citizen (G2C), Government to Government (G2G), Government to Business (G2B)	They are used to improve public service delivery and transparency through digital governance in developing countries.
Resilient Cities Framework (Arup International Development, 2014; Desouza & Flanery, 2013; Hynes et al., 2020)	Ensures cities are prepared to handle natural disasters and economic and social disruptions.	Leadership & Strategy, Health & Wellbeing, Infrastructure & Environment, Economy & Society	Applied in cities vulnerable to natural disasters or socio-economic challenges to improve resilience.
Hybrid Smart City Framework (Lima, 2020)	Combines existing smart city dimensions with organisational adaptability and resilience.	Smart Mobility, Smart Environment, Smart Economy, Smart Governance, Smart People, Smart Living	They are used in case studies of organisations and urban innovation centres transitioning to smart cities.
PLS-SEM Model (Popova & Popovs, 2022)	Analyses the direct and mediating effects of smart economy on other dimensions of smart cities.	Smart Economy, Smart People, Smart Living, Smart Mobility	Applied to examine the role of smart economy in enhancing urban mobility and living conditions.
People, Place, Planet Framework	Focuses on the relationship between people, place, and sustainability to guide smart city planning.	Smart People, Smart Governance, Smart Environment, Smart Living, Smart Mobility, Smart Economy	They balance technological, human, and environmental aspects in smart city development projects.
Smart Regulation Framework (Gasiola et al., 2019)	Explores the role of regulation and governance in enabling smart city technologies.	Smart Governance, Smart Economy, Smart Mobility	They are used in countries where regulatory frameworks are crucial to deploying smart technologies.

## THE SMART CITY DIMENSIONS

Table 2 provides an overview of the dimensions of smart cities examined globally since 2010. The table highlights notable research trends across the first six smart city dimensions, emphasising regional differences and identifying key gaps. Smart People research is prominent in developed countries, particularly the USA and the EU, focusing on citizen engagement and education. However, research in developing and Arab countries is sparse, suggesting more comprehensive studies are needed. Smart Governance is well-studied in developed nations, focusing on transparency and efficiency, while research from developing regions lacks in-depth analysis of governance challenges. In the Arab region, studies mainly concentrate on the UAE, leaving other nations underexplored. Smart Environment shows a significant research gap. While developed countries focus heavily on sustainability practices, studies in developing regions are insufficient to address local environmental challenges. Similarly, Arab countries lack research on specific environmental issues within the smart city framework. In the Smart Mobility dimension, developed regions focus on advanced transportation solutions but often neglect the experiences of marginalised groups in both developing and Arab contexts. Existing research overlooks the integration of transportation modes and their socio-economic impacts. In the Smart Economy dimension, studies in developed countries emphasise economic growth and innovation, while research in developing nations often fails to address economic disparities and limited resources. Arab region studies also lack focus on inclusive economic development. Lastly, in Smart Living, while developed countries report improved quality of life, there is little empirical evidence measuring these outcomes across diverse demographic groups, especially in developing and Arab regions. Research often overlooks the needs of vulnerable populations, such as the elderly and low-income residents.

**Table 2. An overview of the dimensions of smart cities examined globally since 2010**

Dimensions	Developed countries	Developing countries	Arab countries
Smart People	Govada et al. (2017) (USA, EU); Barba-Sánchez et al. (2019) (Spain); Brorström and Diedrich (2022) (Sweden); Khan et al. (2019) (UK); F. Liu et al. (2021) (USA); McMahan et al. (2024) (Canada); Capdevila and Zarlenga (2015) (Spain); Cowley et al. (2018) (UK); Dudzevičiūtė et al. (2017) (Lithuania and Sweden); Del-Real et al. (2023) (USA); Spicer et al. (2023) (Canada)	Oke, Aghimien, Aigbavboa and Akinradewo (2020) (South Africa); Hasan and Mostafa (2024) (Bangladesh); M. A. Ali (2022) (Egypt); Antwi-Afari et al. (2021) (Ghana); B. Ghosh and Arora (2022) (India); Das (2020) (South Africa); N. Ali et al. (2017) (Pakistan); Anh et al. (2021) (Vietnam); Sadoway and Shekhar (2014) (India); Yu et al. (2024) (China)	Aldegheishem (2023) (Saudi Arabia); Riadh (2022) (UAE); Doheim et al. (2019) (Saudi Arabia); Elian and Kisswani (2024) (Kuwait); Ramadan et al. (2025) (GCC); Khasawneh (2022) (Jordan); Taamallah et al. (2019) (Tunisia); Hamza (2015) (Egypt); Asmyatullin et al. (2020) (GCC); Nusir et al. (2023) (Jordan); El Alaoui (2017) (Morocco)
Smart Governance	Cohen (2014) (USA); Nam and Pardo (2014) (USA); Cortés-Cediel et al. (2021) (EU and North America); Anthopoulos et al. (2022) (EU); Demirel and Mülazimoğlu (2022) (EU); Nastjuk et al. (2022) (EU); Spicer (2022) (Canada); Lopes (2017) (EU); Hielscher and Kivimaa (2019) (UK); Z. Wang (2024) (Japan); Demirel and Mülazimoğlu (2022) (EU); Yigitcanlar et al. (2022) (Australia); Smith and Van Dijk (2017) (Netherlands); Daniel and Doran (2013) (Canada); Kubina et al. (2021) (North America and Europe)	Praharaj et al. (2018) (India); Apostol and Stan (2021) (Romania and Bulgaria); Manda and Backhouse (2018) (South Africa); Sulistyaningsih et al. (2024) (South Asia); Tan and Tacihagh (2020) (various developing countries); Bogdea et al. (2022) (Romania); Sulistyaningsih et al. (2024) (various Asian countries); Ramparsad (2020) (South African cities)	Chourabi et al. (2021) (UAE); Al-muraqab (2020) (UAE); Elian and Kisswani (2024) (Kuwait); Rahman et al. (2023) (UAE); Aldegheishem (2023) (Saudi Arabia); Awashreh (2025) (Oman); Shaikh et al. (2024) (Oman); Badran (2025) (Qatar); Al-said (2021) (Egypt); Aldegheishem (2024) (Saudi Arabia); Al-MSie'Deen (2025) (Jordan)

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Dimensions	Developed countries	Developing countries	Arab countries
Smart Environment	Giffinger et al. (2007) (Austria); Batty et al. (2012) (European countries); Carvalho et al. (2019) (Portugal); Afriani et al. (2022) (France); López-Pérez et al. (2023) (Spain); Shabha et al. (2023) (UK); Martin et al. (2018) (Europe and North America); García Fernández and Peek (2020) (EU)	Feng et al. (2020) (China); Macke et al. (2018) (Brazil); A. Ghosh et al. (2025) (Sub-Saharan Africa); Vinod Kumar (2019) (various developing cities); Afriani et al. (2022) (Indonesia); Ghani et al. (2023) (Malaysia); Shrutu et al. (2020) (India); Das (2020) (South Africa); Tetteh and Amponsah (2020) (Sub-Saharan Africa)	Humayun et al. (2020) (Saudi Arabia); Mutambik (2023) (Saudi Arabia); Ragab and Navarra (2023) (Egypt); Bekkar et al. (2021) (Morocco); Tadili and Fasly (2022) (Morocco); Sahib (2019) (UAE); Al-Shoshan (2022) (Jordan)
Smart Mobility	Lima (2020) (EU); Bin Hariz et al. (2021) (Canada); Kunytska et al. (2022) (various EU countries); Wolniak and Grebski (2023) (Singapore and Tokyo); Mora et al. (2021) (Barcelona and Helsinki)	Gasiola et al. (2019) (Brazil); Tanwar and Agarwal (2025) (India); Büyük (2019) (Turkey); Hong and Wong (2017) (Malaysia)	Hozaim and Akre (2017) (UAE); Banna et al. (2023) (Kuwait); Alanazi (2023) (Saudi Arabia)
Smart Economy	Popova and Popovs (2022) (Netherlands and Singapore); Kim et al. (2016) (South Korea); Nandy (2024) (Japan); Ferrara (2015) (Europe)	Gasiola et al. (2019) (Brazil); Staletić et al. (2020) (Serbia); Hassan et al. (2019) (Pakistan); Alam et al. (2016) (Brazil, China, India and Indonesia)	Aldegheishem (2023) (Saudi Arabia); Alghais and Ali (2023) (Kuwait); Baloch et al. (2018) (Saudi Arabia)
Smart Living	Carvalho et al. (2019) (Portugal); García Fernández and Peek (2023) (Spain); Karunanithi and Zhang (2018) (Australia)	Kalinowski et al. (2022) (Poland); Oke, Aghimien, Aigbavboa, and Akinradewo (2020) (South Africa); Dewalska-Opitek (2014) (Poland)	Kalra (2019) (Dubai); Ahamed et al. (2024) (Oman)
Data Security and Privacy	Savola and Abie (2017) (Denmark); Dickens et al. (2019) (USA)	Oke, Aghimien and Aigbavboa (2020) (South Africa)	Almuraqab (2020) (UAE); A. H. Al-Sayed et al. (2025) (Qatar)
Innovation Ecosystems	Etzkowitz and Leydesdorff (1995) (UK and USA); Borghys et al. (2020) (Belgium); Fukuda and Watanabe (2012) (Japan); Tula et al. (2024) (USA and EU); Oh et al. (2016) (USA)	S. Ghosh and Patnaik (2018) (India); Sepasgozar et al. (2019) (India and other developing nations)	Alkhalidi et al. (2025) (Kuwait); Al-Khalifa et al. (2023) (Kuwait); Al-Masri and Abugabah (2021) (Saudi Arabia)
Public-Private Partnerships	Marsden and Rye (2010) (UK); Pianezzi et al. (2023) (Japan)	Praharaj et al. (2018) (India)	Almarri, K. (2019) (UAE); Biygautane et al. (2018) (Kuwait, Saudi Arabia and Qatar)
Resilience and Adaptability	Wilkinson and Orr (2019) (Sweden)	Asamoah (2021) (Ghana); Feng et al. (2020) (China)	R. Al-Sayed (2021) (Jordan)
Renewable Energy	Lund and Mathiesen (2015) (Denmark)	Njeri and Wafula (2019) (Kenya)	Albadi et al. (2020) (Oman); Almulhim (2022) (Saudi Arabia)
Citizen Participation	Smith and Van Dijk (2017) (Netherlands); Caputo et al. (2023) (Italy); Berntzen and Johannessen (2016) (Norway); Choo et al. (2023) (South Korea); Goodman et al. (2020) (Canada)	Mohanty and Choudhury (2019) (India); Chichernea (2015) (Romania)	Al-Harbi and Al-Mutairi (2024) (Kuwait); Almuraqab (2020) (UAE)

The first six dimensions offer a comprehensive framework for understanding smart city development. However, as research evolves, additional dimensions are being recognised, highlighting that smart cities must prioritise sustainability, inclusivity, and resilience beyond technological considerations. In developed countries, key focus areas include data security, innovation ecosystems, public-private partnerships, and citizen participation. Data security is paramount due to the extensive data collection from smart city technologies. For example, Savola and Abie (2017) show how European cities have adopted strict data protection measures in line with the General Data Protection Regulation (GDPR), which standardises privacy laws across the EU and EEA. Innovation ecosystems play a

crucial role by creating networks among universities, industries, and governments to promote advancement and knowledge sharing (Etzkowitz & Leydesdorff, 1995).

In developing countries, the emphasis shifts to addressing challenges such as data security, resilience, and energy efficiency while fostering innovation and citizen engagement. Rapid urbanisation and governance issues heighten data security concerns (S. Ghosh & Patnaik, 2018; Oke, Aghimien & Aigbavboa, 2020). Innovation hubs are vital for addressing urban challenges with technology-driven solutions, though they often face resource limitations. Resilience and adaptability are essential, requiring smart city initiatives to prepare for environmental and economic shocks through strategic planning (Asamoah, 2021). In the Arab region, smart city efforts focus on energy efficiency, innovation, and public-private partnerships. Collaboration between the public and private sectors is key to developing new technologies and advancing urban development (Al-Masri & Abugabah, 2021; Almuraqab, 2020). Emphasis on renewable energy, particularly solar power, is critical for managing rapid urban growth sustainably (Albadi et al., 2020; Almulhim, 2022). Across all regions, increasing citizen participation is a shared priority, with governments using digital platforms to involve residents in urban planning (Almuraqab, 2020; Mohanty & Choudhury, 2019). This engagement is essential for aligning smart city initiatives with the needs and expectations of all community members, ensuring that technological progress benefits everyone. Smart cities strive to achieve inclusivity, resilience, and sustainability through innovation, partnerships, and participatory governance. In summary, the smart city dimensions vary in research focus across regions. Developed countries, particularly the USA and EU, have robust studies on Smart People, Governance, and Environment, focusing on citizen engagement, transparency, and sustainability. However, research from developing and Arab countries is limited, with a particular gap outside the UAE. Smart Mobility and Economy research in developed regions emphasises innovation but lacks focus on marginalised groups and inclusive growth in developing nations. Smart Living studies in developed areas show improved quality of life but fail to address diverse demographic needs. Overall, there is a need for more inclusive, context-sensitive research across all dimensions to better understand smart city impacts on various populations.

### ***THE SMART CITY WHEEL MODEL AND ITS SIX DIMENSIONS***

The Smart City Wheel, introduced by Giffinger et al. (2007), offers a comprehensive framework for analysing urban innovation, balancing technical and social aspects of development. Initially designed as a ranking tool for mid-sized European cities, it evaluates six key dimensions: governance, mobility, people, economy, living, and environment. While some proposed adding a seventh dimension – the quality of life (Colldahl et al., 2013; Shapiro, 2006) – it was concluded that the six dimensions inherently aim to enhance it. Cohen's (2014) model builds on Giffinger's framework by integrating digital technologies and citizen engagement, making it more adaptable to global contexts. Together, these models provide a robust foundation for studying smart cities, combining infrastructure performance with the role of technology and public participation.

Several vital reasons explain its extensive use in research: Firstly, the model is comprehensive, encompassing all critical aspects of smart cities, including technology infrastructure, human capital, governance, and quality of life. Its holistic approach allows researchers to analyse smart city projects from multiple perspectives, ensuring the integration of technology, people, and governance for the sustained success of these initiatives. The six dimensions of the model also offer enough flexibility to be applied to cities globally. This adaptability supports researchers in studying both the technological and social components of smart cities across various geographic areas. Additionally, the model emphasises critical elements of sustainability, such as smart environment and smart living, which are essential goals for contemporary smart cities. Many scholars use these dimensions to explore environmental sustainability and social inclusion, aligning with global efforts to reduce carbon emissions, address climate challenges, promote renewable energy, and ensure equitable access to services. Lastly, the framework attracts researchers from diverse disciplines, fostering collaboration across fields and encouraging interdisciplinary research on the complexities of smart cities in different global contexts. Therefore, this study adopted the Smart City Wheel model due to its holistic and adaptable nature,

which aligns with the study's objectives of exploring the multifaceted aspects of smart city development.

Exploring the Smart City Wheel model in recent literature reveals crucial insights into its application and challenges across urban environments. Cities like Singapore and Amsterdam have enhanced their economic competitiveness through significant investments in the smart economy dimension (Gordon & Koo, 2021; Li et al., 2022), although smaller cities often struggle with limited resources (Y. Zhang et al., 2020). Advances in smart mobility are evident in cities like Barcelona and Helsinki, which have implemented sophisticated transport systems, but developing cities face substantial costs and infrastructure challenges (Mora et al., 2021; Papa & Lauwers, 2015). Copenhagen's leadership in sustainability exemplifies the smart environment dimension, though investments vary based on local priorities (Joss et al., 2021; Peřtová, 2021). Vienna shows effective public engagement in the smart people dimension, yet the digital divide remains a significant barrier (Meijer & Bolívar, 2020). Improvements in smart living are demonstrated by cities like Seoul and New York through smart healthcare and safety initiatives, though unequal access persists (Yang et al., 2021; H. Zhang et al., 2022). Smart governance is advanced in cities like Tallinn and Dubai, but challenges related to scalability and inclusivity remain (Chourabi et al., 2021; Kavanagh et al., 2022; Papa & Lauwers, 2015). Overall, the success of the Smart City Wheel model depends on adapting strategies to local conditions, financial resources, and effective stakeholder coordination (Agbali et al., 2019; Cocchia, 2014; Fernandez-Anez et al., 2018; Vanolo, 2021).

Table 3 provides a comprehensive summary of key studies that have applied the Smart City Wheel model, covering the dimensions of Smart Economy, Smart Mobility, Smart Governance, Smart Environment, Smart People, and Smart Living. The presented table effectively outlines the application of the six dimensions of smart cities across developed, developing, and Arab countries. Each dimension reveals varying academic interest and research focus levels, indicating differences in the development and implementation of smart city strategies across different regions. Developed countries show a broader range of studies across all six dimensions, indicating a more advanced stage of smart city initiatives. This suggests that these nations have more established frameworks for research and development in smart city strategies. Developing countries have a notable presence in all dimensions but with fewer studies than developed countries. This could indicate that while the importance of smart city concepts is recognised, the research and implementation are still in the earlier stages. Arab countries exhibit limited studies in some dimensions, particularly in Smart Economy and Smart People, highlighting a potential gap in understanding and addressing these areas. Overall, the table demonstrates significant regional variations in research on the six dimensions of smart cities. It emphasises the need for more extensive studies in developing and Arab countries to bridge gaps in understanding and implementation. Increasing awareness and investment in these dimensions is crucial for fostering smart city development that aligns with local needs and capacities. This analysis can guide future research agendas and policymaking to promote more balanced smart city advancements across regions.

**Table 3. A comprehensive summary of key studies that have applied the Smart City Wheel model**

Dimensions	Developed countries	Developing countries	Arab countries
Smart Economy	Angelidou (2015), Baltac (2019), Batty et al. (2012), Caird and Hallett (2019), Caragliu et al. (2011), Cohen (2014), Giffinger et al. (2007), Harrison et al. (2010), Kozłowski and Suwar (2021), Mora et al. (2017)	Chourabi et al. (2021), Cocchia (2014), Nam and Pardo (2014), Shah et al. (2017)	AlAli et al. (2023), Sumra et al. (2025)
Smart Mobility	Batty et al. (2012), Caird and Hallett (2019), Cohen (2014), Giffinger et al. (2007), Harrison et al. (2010), Kozłowski and Suwar (2021)	Chourabi et al. (2021), Monzon (2015), Morvaj et al. (2011), Shah et al. (2017), Zanella et al. (2014)	AlAli et al. (2023)

Dimensions	Developed countries	Developing countries	Arab countries
Smart Governance	Baltac (2019), Batty et al. (2012), Caird and Hallett (2019), Caragliu et al. (2011), Cohen (2014), Giffinger et al. (2007), Harrison et al. (2010), Kozłowski and Suwar (2021), Neirotti et al. (2014), Paskaleva (2011)	Chourabi et al. (2021), Cocchia (2014), Nam and Pardo (2014), Shah et al. (2017), Zanella et al. (2014)	AlAli et al. (2023)
Smart Environment	Albino et al. (2015), Baltac (2019), Batty et al. (2012), Cohen (2014), Giffinger et al. (2007), Harrison et al. (2010), Kozłowski and Suwar (2021), Neirotti et al. (2014), Paskaleva (2011)	Chourabi et al. (2021), Cocchia (2014), Morvaj et al. (2011), Nam and Pardo (2014), Shah et al. (2017), Zanella et al. (2014)	AlAli et al. (2023)
Smart People	Allwinkle and Cruickshank (2011), Angelidou (2015), Baltac (2019), Batty et al. (2012), Caird and Hallett (2019), Cohen (2014), Giffinger et al. (2007), Harrison et al. (2010), Hollands (2015), Kozłowski and Suwar (2021)	Chourabi et al. (2021), Nam and Pardo (2014), Shah et al. (2017)	AlAli et al. (2023)
Smart Living	Allwinkle and Cruickshank (2011), Baltac (2019), Batty et al. (2012), Cohen (2014), Garau and Pavan (2018), Giffinger et al. (2007); Kozłowski and Suwar (2021), Neirotti et al. (2014)	Chourabi et al. (2021), Cocchia (2014), Shah et al. (2017)	AlAli et al. (2023)

The distribution of these references across the number of dimensions studied in the context of smart cities provides valuable insights into the evolution of research in this field. Table 4 categorises these studies based on the number of dimensions of smart cities they addressed, ranging from those exploring all six dimensions to those focusing on just one. Studies addressing all six dimensions are relatively few, indicating that holistic approaches remain limited. Only a small number of studies have explored five dimensions, suggesting that research adopting broad but slightly narrower scopes is also underrepresented. By contrast, a larger cluster of studies has examined four dimensions, while a smaller number have focused on three. Research covering two dimensions is comparatively frequent, often investigating the interplay between specific aspects. In contrast, studies addressing a single dimension are fewer in number. This distribution suggests that while there is substantial research interest in selective or targeted aspects of smart cities, there is a gap in comprehensive studies that address the full breadth of the smart city concept, which could provide a more integrated understanding of smart city frameworks and their interrelated components.

**Table 4. Classification of studies based on the number of smart city dimensions they addressed**

No. of dimensions	References
Six dimensions	AlAli et al. (2023), Batty et al. (2012), Chourabi et al. (2021), Cohen (2014), Giffinger et al. (2007), Kozłowski and Suwar (2021), Shah et al. (2017)
Five dimensions	Harrison et al. (2010)
Four dimensions	Baltac (2019), Batty et al. (2012), Caird and Hallett (2019), Cocchia (2014), Nam and Pardo (2014), Zanella et al. (2014)
Three dimensions	Neirotti et al. (2014)
Two dimensions	Albino et al. (2015), Allwinkle and Cruickshank (2011), Angelidou (2015), Caragliu et al. (2011), Morvaj et al. (2011), Paskaleva (2011)
One dimension	Garau and Pavan (2018), Hollands (2015), Monzon (2015), Mora et al. (2017)

### ***PUBLIC PERCEPTIONS OF SMART CITY DIMENSIONS***

Research on public perceptions of smart cities varies significantly across regions. Developed countries have the most extensive body of research, with numerous studies exploring technological innovation, governance, and sustainability (e.g., Abellá-García et al., 2015; Appio et al., 2019; Bakıcı et al., 2013; Capdevila & Zarlenga, 2015; Caragliu et al., 2011; Džunić et al., 2023; Schelings et al., 2023; Yeh, 2017). Developing countries have fewer studies, but there is a growing focus on addressing socio-economic challenges and infrastructure development (e.g., Georgiadis et al., 2021; Hartley, 2023; He et al., 2023; Macke et al., 2018; Oke, Aghimien, & Aigbavboa, 2020). In Arab countries, research is more limited, with recent studies focusing on governance reforms and integrating cultural values into smart city initiatives (e.g., AlAli et al., 2023; Aldegheishem, 2023). This disparity highlights the need for more research in developing and Arab regions to understand local public perceptions better.

On the other hand, the six core dimensions of a smart city – governance, mobility, people, economy, living, and environment – are viewed differently by communities in developed, developing, and Arab countries. Across all regions, people perceive the “smartness” of a city through how well these dimensions improve day-to-day life, with varied emphasis depending on the local context and societal needs. In developed countries, citizens often focus on how smart governance, mobility, and environmental initiatives can enhance efficiency, sustainability, and quality of life (Appio et al., 2019; Džunić et al., 2023; Schelings et al., 2023). However, there is a limited exploration of how marginalised communities or low-income groups perceive and benefit from these initiatives. In developing countries, public perceptions are more centred on the role of smart city initiatives in addressing socioeconomic inequalities, infrastructure challenges, and improving access to essential services (Georgiadis et al., 2021; Hartley, 2023; He et al., 2023). Citizens in these regions tend to prioritise solutions that directly address economic development and equitable resource distribution. There is less understanding of how these initiatives can ensure long-term sustainability and adaptability, particularly in rural areas. In Arab countries, public perceptions of smart city dimensions strongly emphasise governance reforms, modernising infrastructure, and integrating cultural values with technological advancements (AlAli et al., 2023; Aldegheishem, 2023). There is limited research on how different demographic groups, like youth and women, perceive smart cities and how these views influence project success. Across all regions, further research on public participation, transparency, and their role in smart city development is essential.

### **THEORETICAL MODEL AND RESEARCH QUESTIONS**

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Given the above, this study adopts the Smart City Wheel model initially developed by Giffinger et al. (2007) and later expanded by Cohen (2014) due to its holistic and adaptable nature, which aligns with the study’s objectives of exploring the multifaceted aspects of smart city initiatives. The model identifies six key dimensions – governance, mobility, people, economy, living, and environment – that determine a city’s “smartness,” as shown in Figure 1. Cohen’s (2014) expansion emphasises the integration of digital technologies and citizen engagement, enhancing the model’s global applicability. Each dimension encompasses specific factors, and the level of development in these areas collectively determines the city’s overall “smartness.” Serving as a ranking tool and an assessment framework, the model helps pinpoint areas requiring improvement to guide a city’s evolution into a fully developed “smart city.”



**Figure 1. The Smart City Wheel model was developed by Giffinger et al. (2007) and expanded by Cohen (2014) (adopted from Georgiadis et al., 2021)**

The six dimensions typically include:

1. **Smart Governance:** This dimension enhances public services, transparency, and decision-making by integrating technology with governance. Effective administration, public participation, and data-driven policymaking are key tenets.
2. **Smart Mobility:** This dimension aims to improve transportation systems through technological breakthroughs, decrease congestion, increase efficiency, and encourage environmentally friendly forms of mobility. It encompasses cutting-edge mobility solutions, better public transport, and smart traffic management.
3. **Smart Economy:** This dimension seeks to advance the economy through technological advancements and new ideas. Building a prosperous economy involves encouraging entrepreneurship, drawing in investors, and bolstering digital infrastructure.
4. **Smart People:** This dimension highlights human capital's contribution to Smart City development. It is centred on education, skill development, and community involvement to ensure people can take advantage of and help with smart city projects.
5. **Smart Environment:** This dimension integrates technology to manage natural resources, reduce waste, and mitigate pollution. It addresses environmental sustainability. Smart grids, environmentally friendly technology, and adaptation plans to climate change are all part of it.
6. **Smart Living:** This dimension refers to an approach to housing that prioritises residents' health, safety, and overall well-being through smart technologies. Things like smart homes, healthcare advances, and services that help people live well fall under this category.

By examining these interrelated dimensions, the Smart City Wheel model offers a comprehensive perspective on smart city projects, which aim to improve urban areas in terms of efficiency, sustainability, and quality of life. Hence, this study explored public perceptions of the smart city concept in Kuwait and assessed their understanding of its features and dimensions by answering the following questions:

1. What is the public's awareness and perception of the Smart City concept?
2. How do the six Smart City dimensions correlate with public perception of the Smart City concept?

3. How does the public perceive the importance of the six key Smart City dimensions?
4. Which Smart City dimensions are most actively observed by the public, and which are less visible?
5. Which Smart City dimensions are most and least identified for improvement by the public?
6. How do the perceived correlations between the six Smart City dimensions and the Smart City concept differ based on the public's characteristics?
7. How does the perceived importance of the six Smart City dimensions differ according to the public's characteristics?

## **METHOD**

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### ***RESEARCH INSTRUMENT***

To achieve the study's objectives, a cross-sectional study was conducted among individuals in Kuwait to examine perceptions of the Smart City concept and its dimensions. Data were collected using an online, self-administered, voluntary, and anonymous questionnaire, which comprised two main sections:

- The first section collected demographic information through six questions addressing gender, age, education, occupation, nationality, and familiarity with the Smart City concept (Bryman, 2016). These demographic variables were essential for understanding the respondents' backgrounds and general awareness of Smart City initiatives, which can influence perceptions of Smart City developments (Creswell & Creswell, 2018).
- The second section included five questions: two used a five-point Likert scale to assess the perceived importance and current application of the six dimensions of a Smart City—smart people, smart economy, smart governance, smart living, smart mobility, and smart environment (Albino et al., 2015; Georgiadis et al., 2021). The Likert scale was from 5 (“strongly agree”) to 1 (“strongly disagree”). Additionally, one Yes/No question gauged the perceived level of effort to transform their city into a Smart City, and two questions invited respondents to reflect on improvements made according to the six dimensions and identify areas needing further enhancement. The study utilised the six primary dimensions of a smart city, as depicted in Figure 1. The degree of “smartness” is determined by the level of advancement achieved in each of the six main dimensions of smart cities.

This approach provided a comprehensive assessment of both demographic factors and perceptions regarding Smart City dimensions, facilitating a nuanced understanding of how respondents view Smart City initiatives in their local context (Sun et al., 2013).

### ***SAMPLING PROCEDURE AND SIZE***

The study's target demographic is all individuals currently residing in Kuwait. To ensure the study gathered relevant data from respondents in Kuwait, a screening question was included to determine if participants had prior knowledge of the Smart City concept. As the study aimed to target individuals with relevant understanding, a purposive sampling method was used, combining convenience and snowball sampling techniques. This allowed for targeted recruitment of participants, meeting the study's criteria (Etikan et al., 2016). A minimum sample size of 219 responses was needed for adequate statistical analysis. This was calculated using G\*Power 3 software, with an intermediate effect size of 0.06, a significance level of 0.05, a power of 0.95, and four independent variables. Ultimately, 434 individuals participated in the study, and their responses were included in the final analysis.

### ***DATA COLLECTION PROCEDURE***

A web link to the questionnaire was created using Google Forms and remained accessible for about two months. Participants were recruited via an email announcement that included the survey link, a

standard online survey method (Dillman et al., 2014). Initially, recruitment focused on individuals encouraged to share the survey link with their network, employing a snowball sampling technique (Bryman, 2016). Additionally, the link was shared on social media platforms like Instagram, LinkedIn, and Facebook, which effectively boosted survey participation rates (Couper, 2008). Respondents had to be at least 18 years old to be eligible. The study's nature and purpose were communicated, and participants were asked to provide honest opinions. Detailed instructions on completing the questionnaire were provided on the cover page to prevent misunderstandings (Fowler, 2014). Participants' anonymity and confidentiality were guaranteed, and participation was entirely voluntary. The questionnaire took approximately 10 minutes, which aligns with best practices to avoid respondent fatigue (de Leeuw, 2008).

### ***DATA ANALYSIS***

Data were analysed using the Statistical Package for the Social Sciences (SPSS) software (version 19.0). This descriptive study employed descriptive statistics, including means, standard deviations, frequencies, and percentages, to summarise participant responses and overall trends. Independent-samples t-tests were conducted to examine differences in participants' perceptions of the six Smart City dimensions across demographic groups. The threshold for statistical significance was set at  $p < 0.05$ , consistent with standard practices in social science research.

## **FINDINGS**

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### ***DEMOGRAPHIC DATA***

Table 4 displays the characteristics of the respondents. As shown in the table, the gender distribution of respondents was nearly equal, with 50.9% female and 49.1% male. Most respondents (61.5%) were aged between 18-30, and 25.1% were between 31-40. Regarding education, 46.1% held bachelor's degrees, 22.4% had college diplomas, and 18.7% had high school certificates. Regarding nationality, 48.8% were Arab-non-Kuwaiti, 40.6% were Kuwaiti, and 10.6% were non-Kuwaitis from various other origins, including other Asian countries. Employment status showed that 57.1% were employed, while 31.6% were students.

### ***AWARENESS VS. UNAWARENESS OF THE SMART CITY CONCEPT***

Table 5 presents respondents' awareness and unawareness of the Smart City concept. The table shows that 46.1% of respondents were aware of the idea, and 40.5% of these individuals believed that efforts were being made to transform their city into a "Smart City." Among those unaware of the concept (53.9%), only 26.1% thought local authorities had taken steps to inform the public. Despite this, 77.8% expressed a desire to learn more about the concept in the future, and 63.2% were interested in participating in their city's development decisions through a digital platform.

**Table 4. Characteristics of the respondents (n=434)**

Characteristics	Categories	Frequency	%
Sex	Female	221	50.9%
	Male	213	49.1%
Age range	18-30 years	267	61.5%
	31-40 years	109	25.1%
	41-50 years	44	10.1%
	51-60 years	11	2.5%
	61 years & above	3	0.7%
Education	Below High school	3	0.7%
	High school	81	18.7%
	Diploma	97	22.4%
	Bachelor's degree	200	46.1%
	Master's degree	25	5.8%
	PhD Degree	28	6.5%
Nationality	Kuwaiti	176	40.6%
	Arab-non-Kuwaiti	212	48.8%
	Non-Arab	46	10.6%
Occupation	Student	137	31.6%
	Employed	248	57.1%
	Self-employed/freelancer	25	5.8%
	Retired	7	1.6%
	Unemployed	17	3.9%

**Table 5. Respondents' awareness vs. unawareness of the smart city concept (n=434)**

Questions	Categories	Frequency	%
Have you ever heard the term "Smart City" before?	No	234	53.9%
	Yes	200	46.1%
Do you think that efforts have been made for your city to be transformed into a "Smart City"?	No	71	35.5%
	Yes	81	40.5%
	I do not know	48	24.0%
Have the local authorities in your city taken the initiative to inform the people about the Smart City concept?	No	69	29.5%
	Yes	61	26.1%
	Unaware	104	44.4%
Are you willing to learn more about the Smart City concept in the future?	No	9	3.8%
	Yes	182	77.8%
	Not sure	43	18.4%
Are you willing to participate in the decision-making for your city's development via a digital platform?	No	19	8.1%
	Yes	148	63.2%
	Not sure	67	28.6%

### ***PERCEIVED CORRELATION OF THE SIX DIMENSIONS WITH THE SMART CITY CONCEPT***

Table 6 illustrates the respondents' perceived correlation of the six dimensions with the Smart City concept. The results are reported using the following scale: (i) high agreement (mean  $\geq 3.7$ ), (ii) medium agreement ( $2.4 \leq \text{mean} < 3.7$ ), and (iii) low agreement (mean  $< 2.4$ ). According to Table 6, the six key dimensions are highly correlated with the Smart City concept. Respondents perceived all six

key dimensions highly, with the following means: smart mobility (mean=4.06), smart living (mean=4.01), smart environment (mean=4.00), smart governance (mean=3.92), smart economy (mean=3.88), and smart people (mean=3.75).

**Table 6. Respondents' perceived correlation of the six dimensions with the Smart City concept (n=200)**

To what extent do you believe the following concepts correlate with the smart city concept?	Mean	SD
<b>Smart mobility</b> (sustainable, innovative, and safe transport systems)	4.06	1.089
<b>Smart living</b> (housing quality, individual safety, touristic attractiveness, improved health conditions and cultural facilities)	4.01	1.103
<b>Smart environment</b> (clean and sustainable resources, pollution reduction, environmental protection).	4.00	1.190
<b>Smart governance</b> (allows the public to engage in decision-making, public and social services, transparent governance, political strategies, and perspectives)	3.92	1.183
<b>Smart economy</b> (innovative, entrepreneurship, productivity, flexible labour market)	3.88	1.092
<b>Smart people</b> (qualified, innovative, active people)]	3.75	1.185

### *PERCEIVED IMPORTANCE OF THE SIX SMART CITY DIMENSIONS*

Table 7 presents respondents' assessments of the importance of the six Smart City dimensions. As indicated in Table 7, these dimensions are considered highly significant. Accordingly, respondents rated all six key dimensions highly, in the following order of importance: smart governance (mean=4.00), smart mobility (mean=3.99), smart environment (mean=3.95), smart living (mean=3.92), smart economy (mean=3.91), and smart people (mean=3.81).

**Table 7. Respondents' assessments of the importance of the six Smart City dimensions (n=200)**

Evaluate the following six smart city dimensions based on their importance	Mean	SD
<b>Smart governance</b> (allows the public to engage in decision-making, public and social services, transparent governance, political strategies, and perspectives)	4.00	1.165
<b>Smart mobility</b> (sustainable, innovative, and safe transport systems)	3.99	1.103
<b>Smart environment</b> (clean and sustainable resources, pollution reduction, environmental protection)	3.95	1.146
<b>Smart living</b> (housing quality, individual safety, touristic attractiveness, improved health conditions and cultural facilities)	3.92	1.152
<b>Smart economy</b> (innovative, entrepreneurship, productivity, flexible labour market)	3.91	1.155
<b>Smart people</b> (qualified, innovative, active people)	3.81	1.224

### *ACTIVITY OBSERVED IN THE SIX SMART CITY DIMENSIONS*

Table 8 displays respondents' observations of activities across the six Smart City dimensions. The data reveals varied levels of activity in these dimensions. The most frequently observed activities were in the smart people (52%), smart economy (40.5%), and smart living (40%) dimensions. Conversely, the least observed activities were in the smart governance (36%), smart environment (35.5%), and smart mobility (25%) dimensions.

**Table 8. Respondents' observations of activities across the six Smart City dimensions (n=200)**

Have you noticed any activity in the following sectors (choose more than one of the given options)?	Frequency	%
<b>Smart people</b> (qualified, innovative, active people)	104	52%
<b>Smart economy</b> (innovative, entrepreneurship, productivity, flexible labour market)	81	40.5%
<b>Smart living</b> (housing quality, individual safety, touristic attractivity, improved health conditions and cultural facilities)	80	40%
<b>Smart governance</b> (allows the public to engage in decision-making, public and social services, transparent governance, political strategies, and perspectives)	72	36%
<b>Smart environment</b> (clean and sustainable resources, pollution reduction, environmental protection).	71	35.5%
<b>Smart mobility</b> (sustainable, innovative, and safe transport systems)	50	25%

### *AREAS NEEDING IMPROVEMENT IN THE SIX SMART CITY DIMENSIONS*

Table 9 shows the respondents' identifying areas needing improvement across the six Smart City dimensions. The results indicate diverse needs for enhancement. The dimensions most frequently cited for improvement were smart environment (63%), smart living (60%), and smart mobility (50.5%). Conversely, the dimensions least frequently identified for improvement were smart people (49%), smart economy (49%), and smart governance (46%).

**Table 9. Respondents' identifying areas needing improvement across the six Smart City dimensions (n=200)**

Which of the following areas do you think improvements need to be made in the city where you live? (choose more than one of the given options)	Frequency	%
<b>Smart environment</b> (clean and sustainable resources, pollution reduction, environmental protection)	126	63%
<b>Smart living</b> (housing quality, individual safety, touristic attractivity, improved health conditions and cultural facilities)	120	60%
<b>Smart mobility</b> (sustainable, innovative, and safe transport systems)	101	50.5%
<b>Smart people</b> (qualified, innovative, active people)	98	49%
<b>Smart economy</b> (innovative, entrepreneurship, productivity, flexible labour market)	98	49%
<b>Smart governance</b> (allows the public to engage in decision-making, public and social services, transparent governance, political strategies, and perspectives)	92	46%

### *DIFFERENCES IN THE PERCEIVED CORRELATION OF THE SIX DIMENSIONS WITH THE SMART CITY CONCEPT*

Table 10 shows the differences in the perceived correlation of the six dimensions and the Smart City concept based on the respondents' characteristics. Significant differences in perceptions of the "smart people" and "smart living" dimensions were observed between employed and non-employed respondents. Employed respondents rated these dimensions highly correlated with the Smart City concept ( $M=3.87$ ,  $p = .036$  for smart people and  $M=4.17$ ,  $p = .003$  for smart living). In contrast, non-employed respondents perceived them as only moderately correlated ( $M=3.50$  for smart people

and  $M=33.68$  for smart living). The smart economy dimension revealed significant disparities across age groups and employment status. Individuals aged 31 years and above ( $M=4.08$ ,  $p = .008$ ) and employed individuals ( $M=4.02$ ,  $p = .008$ ) considered this dimension highly correlated with the Smart City concept. In contrast, those aged 18 to 30 ( $M=3.67$ ) and non-employed individuals ( $M=3.59$ ) viewed it as only moderately correlated. The smart environment dimension also exhibited notable age and employment status disparities. Individuals aged 31 years and above ( $M=4.18$ ,  $p = .032$ ) and employed individuals ( $M=4.20$ ,  $p = .001$ ) considered this dimension highly correlated with the Smart City concept. In contrast, individuals aged 18 to 30 ( $M=3.82$ ) also viewed it as highly correlated, whereas non-employed individuals ( $M=3.59$ ) perceived it as only moderately correlated. The smart mobility dimension significantly differed across age groups, education levels, and employment status. Individuals aged 31 years and above ( $M=4.23$ ,  $p = .033$ ), those with a bachelor's degree or higher ( $M=4.19$ ,  $p = .033$ ), and employed individuals ( $M=4.29$ ,  $p = .000$ ) considered this dimension to be highly correlated with the Smart City concept. In contrast, individuals aged 18 to 30 years ( $M=3.90$ ) and those with a diploma or less ( $M=3.85$ ) also perceived it as highly correlated, while non-employed individuals ( $M=3.61$ ) viewed it as only moderately correlated. The smart governance dimension revealed significant disparities across age groups and employment status. Individuals aged 31 years and above ( $M=4.13$ ,  $p = .011$ ) and employed individuals ( $M=4.04$ ,  $p = .033$ ) viewed this dimension as highly correlated with the Smart City concept. Conversely, while individuals aged 18 to 30 ( $M=3.70$ ) also considered it highly correlated, non-employed respondents ( $M=3.67$ ) perceived it as only moderately correlated.

**Table 10. Differences in the perceived correlation of the six dimensions and the Smart City concept based on the respondents' characteristics (n=200)**

Variables	Categories (n)	Smart people		Smart economy		Smart environment		Smart mobility		Smart living		Smart governance	
		M	P	M	P	M	P	M	P	M	P	M	P
Sex	Male (108)	3.66	.232	3.87	.893	3.91	.234	4.04	.695	4.00	.890	3.81	.139
	Female (92)	3.86		3.89		4.11		4.10		4.02		4.05	
Age range	18 to 30 years (98)	3.60	.084	3.67	.008*	3.82	.032*	3.90	.033*	3.87	.073	3.70	.011*
	31 years and older (102)	3.89		4.08		4.18		4.23		4.15		4.13	
Education	Diploma and below (74)	3.76	.951	3.81	.493	3.81	.085	3.85	.033*	3.89	.247	3.80	.262
	Bachelor and above (126)	3.75		3.92		4.11		4.19		4.08		3.99	
Employment	Not employed (66)	3.50	.036	3.59	.008*	3.59	.001*	3.61	.000*	3.68	.003	3.67	.033*
	Employed (134)	3.87	*	4.02		4.20		4.29		4.17	*	4.04	
Nationality	Kuwaiti (105)	3.78	.699	3.92	.552	4.10	.235	4.17	.147	4.09	.309	4.02	.214
	Non-Kuwaiti (95)	3.72		3.83		3.89		3.95		3.93		3.81	

Note: \* $p < 0.05$ ,  $M=Mean$

To summarise, the perceived correlation between the six dimensions and the Smart City concept varied according to respondents' employment status. Employed individuals perceived these dimensions as highly correlated with the Smart City concept, while non-employed individuals perceived them as only moderately correlated. Although the importance of four Smart City dimensions (i.e., smart economy, smart environment, smart mobility, and smart governance) varied according to respondents' age groups, both age groups (i.e., individuals aged 18 to 30 and those aged 31 years and above) perceived these dimensions as highly correlated with the Smart City concept, except for the smart economy dimension. Individuals aged 31 years and above considered the smart economy dimension highly correlated with the Smart City concept, while those aged 18 to 30 viewed it as only moderately correlated. Although the perceived correlation between the smart mobility dimension and the Smart

City concept varied by respondents' education level, individuals with a bachelor's degree or higher and those with a diploma or less viewed this dimension as highly correlated.

### ***DIFFERENCES IN THE PERCEIVED IMPORTANCE OF THE SIX SMART CITY DIMENSIONS***

Table 11 shows the differences in the perceived importance of the six Smart City dimensions according to the respondents' characteristics. Significant differences in perceptions of the importance of the "smart people" dimension were observed across education levels and employment statuses. Respondents with a bachelor's degree or higher ( $M = 3.96$ ,  $p = .028$ ) and employed individuals ( $M = 3.96$ ,  $p = .015$ ) rated this dimension highly important. In contrast, those with a diploma or less ( $M = 3.57$ ) and non-employed individuals ( $M = 3.52$ ) considered it only moderately necessary. The smart economy dimension significantly differed across age groups, education levels, and employment status. Individuals aged 31 years and above ( $M = 4.10$ ,  $p = .022$ ), those with a bachelor's degree or higher ( $M = 4.05$ ,  $p = .034$ ), and employed individuals ( $M = 4.07$ ,  $p = .005$ ) rated this dimension as highly important. Similarly, individuals aged 18 to 30 ( $M = 3.72$ ) also perceived it as highly important. However, those with a diploma or less ( $M = 3.69$ ) and non-employed individuals ( $M = 3.59$ ) considered it only moderately necessary. The importance of the smart environment, mobility, and living dimensions showed notable disparities in age and employment status. Individuals aged 31 years and above ( $M = 4.18$ ,  $p = .004$  for smart environment;  $M = 4.19$ ,  $p = .010$  for smart mobility; and  $M = 4.12$ ,  $p = .015$  for smart living) and employed individuals ( $M = 4.12$ ,  $p = .003$  for smart environment;  $M = 4.18$ ,  $p = .000$  for smart mobility; and  $M = 4.06$ ,  $p = .018$  for smart living) rated these dimensions as highly important. Conversely, while individuals aged 18 to 30 ( $M = 3.71$  for smart environment;  $M = 3.79$  for smart mobility; and  $M = 3.72$  for smart living) also viewed them as highly important, non-employed individuals ( $M = 3.61$  for smart environment;  $M = 3.61$  for smart mobility; and  $M = 3.65$  for smart living) perceived them as only moderately necessary. Although significant differences in perceptions of the importance of the "smart governance" dimension were observed between employed and non-employed respondents, both groups rated this dimension as highly important, with employed respondents ( $M = 4.12$ ,  $p = .039$ ) and non-employed respondents ( $M = 3.76$ ).

To summarise, the importance of all six Smart City dimensions varied according to respondents' employment status. Employed individuals rated these dimensions as highly important. In contrast, non-employed individuals perceived them as only moderately necessary, except for the smart governance dimension, which both groups rated as highly important. Although the importance of the four Smart City dimensions (i.e., smart economy, smart environment, smart mobility, and smart living) varied according to respondents' age groups, both age groups (i.e., individuals aged 18 to 30 and those aged 31 years and above) rated these dimensions as highly important. The importance of smart people and smart economy dimensions varied according to respondents' education level. Individuals with a bachelor's degree or higher rated these dimensions as highly important, whereas those with a diploma or less considered them only moderately necessary.

It is important to acknowledge that the sample was largely composed of individuals under the age of 40 and with higher education levels, reflecting a digitally literate and more engaged segment of the population. This demographic profile likely influenced the patterns observed in the findings, particularly the relatively high levels of awareness of the Smart City concept, interest in learning more, and willingness to participate in digital civic engagement. The reliance on online and snowball sampling may have excluded older or less digitally connected individuals, whose perceptions could differ. As a result, these findings may not fully represent the broader Kuwaiti population, and caution should be exercised when interpreting the results in a general context. These limitations are further discussed in the relevant sections of the paper.

**Table 11. Differences in the perceived importance of the six Smart City dimensions according to the respondents' characteristics (n=200)**

Variables	Categories (n)	Smart people		Smart economy		Smart environment		Smart mobility		Smart living		Smart governance	
		M	P	M	P	M	P	M	P	M	P	M	P
Sex	Male (108)	3.79	.727	3.85	.404	3.90	.490	3.89	.161	3.82	.180	3.96	.627
	Female (92)	3.85		3.99		4.01		4.11		4.04		4.04	
Age range	18 to 30 years (98)	3.68	.137	3.72	.022*	3.71	.004*	3.79	.010*	3.72	.015*	3.86	.089
	31 years and older (102)	3.94		4.10		4.18		4.19		4.12		4.14	
Education	Diploma and below (74)	3.57	.028*	3.69	.034*	3.84	.290	3.93	.573	3.81	.284	3.96	.707
	Bachelor and above (126)	3.96		4.05		4.02		4.02		3.99		4.02	
Employment	Not employed (66)	3.52	.015*	3.59	.005*	3.61	.003*	3.61	.000*	3.65	.018*	3.76	.039*
	Employed (134)	3.96		4.07		4.12		4.18		4.06		4.12	
Nationality	Kuwaiti (105)	3.88	.459	4.02	.181	4.06	.165	4.07	.302	3.91	.890	4.09	.275
	Non-Kuwaiti (95)	3.75		3.80		3.83		3.91		3.94		3.91	

Note: \* $p < 0.05$ , M=Mean

## DISCUSSION

The results reveal significant insights into public awareness and perceptions of the Smart City concept. The results showed that slightly less than half of the participants had some understanding of what a Smart City entails, suggesting a moderate level of awareness within the community. Among those aware of the concept, 40.5% believe that efforts are being made to transform their city into a Smart City. This implies that many informed individuals perceive active steps toward Smart City initiatives. A significant 53.9% of respondents are unaware of the Smart City concept. This majority highlights a substantial gap in public knowledge and suggests the need for enhanced educational and informational campaigns. Among those unaware of the concept, only 26.1% feel that local authorities have tried to inform the public. This low percentage indicates a perceived deficiency in communication and outreach efforts by local authorities regarding Smart City initiatives. Despite the lack of awareness, 77.8% of respondents wanted to learn more about the Smart City concept. This high interest suggests public engagement and support for Smart City projects could significantly increase with proper information dissemination. Additionally, 63.2% of respondents showed interest in participating in their city's development decisions through a digital platform. This indicates a readiness among the public to engage with Smart City initiatives and utilise technology for civic participation.

The results also indicate that respondents strongly correlate the six key dimensions and the Smart City concept. All six dimensions received high average ratings, suggesting they are considered integral components of a Smart City. Smart mobility received the highest mean score (mean=4.06), indicating that respondents view efficient and innovative transportation solutions as the most crucial element of a Smart City. Smart living (mean=4.01) is valued for quality-of-life enhancements like healthcare and safety. Smart Environment (mean=4.00) is highly regarded, reflecting community concern for ecological health. Smart governance (mean=3.92) is seen as essential for Smart City success. The slightly lower yet still significant rating for smart economy (mean=3.88) shows that economic development and innovation are critical, though perhaps perceived as less immediate compared to mobility and living conditions. Smart people, focusing on education and social inclusion, received the lowest mean score (mean=3.75), but it is still considered necessary.

Regarding respondents' evaluation of the importance of the six Smart City dimensions, the results indicated that all dimensions are deemed highly important and ranked in the following order of significance: smart governance, smart mobility, smart environment, smart living, smart economy, and finally, smart people. The high ratings across all dimensions suggest that respondents support a balanced approach to Smart City development, where no single dimension is neglected. Each aspect is

seen as contributing to the overall success and sustainability of the Smart City. Authorities can prioritise their policies and initiatives using these insights. Emphasising governance, mobility, and environmental sustainability could address immediate concerns and build a strong foundation for further development.

The respondents' observations of activities across the six Smart City dimensions reveal varying activity levels in these areas. The results showed that the most frequently observed activities were in smart people, suggesting that education, skills development, and social inclusion initiatives are more visible or prominent in the community. A smart economy indicates active efforts to promote economic development and technological advancements, and smart living reflects ongoing efforts to improve living conditions. Conversely, the least observed activities were in smart governance, which may point to the need for greater visibility and communication of governance initiatives; smart environment, suggesting a potential area for increased focus and public engagement; and smart mobility, indicating that transportation and mobility improvements are not as apparent to respondents, highlighting a critical area for development and increased effort.

The results highlighted diverse needs for improvement across the six Smart City dimensions. The most frequently cited areas for enhancement are smart environment, reflecting vital community concern for environmental issues and a demand for better sustainability measures; smart living, indicating a significant desire for better quality of life through improvements in healthcare, safety, and housing; and smart mobility, pointing to concerns about the efficiency and innovation of urban transportation. In contrast, the least frequently identified areas for improvement are smart people, smart economy, and smart governance. This suggests that while these dimensions are acknowledged as needing attention, they are viewed as less urgent than environmental issues, living conditions, and mobility. Authorities should focus on the most frequently cited areas to address immediate concerns and boost public satisfaction while ensuring a balanced approach with adequate attention and resources to all dimensions. Effective communication, community engagement, strategic resource allocation, and ongoing monitoring will be essential for addressing varied needs and achieving comprehensive Smart City development.

The results reveal distinct variations in how demographics perceive the correlation between the six Smart City dimensions and the Smart City concept. Employed individuals consistently viewed all six dimensions as highly correlated with the Smart City concept, indicating a strong alignment between their employment status and the perceived relevance of these dimensions. In contrast, non-employed individuals perceived these dimensions as only moderately correlated, suggesting a less pronounced connection between their status and the Smart City concept. Among age groups, individuals aged 18 to 30 and those aged 31 years and above recognised the importance of four key dimensions – smart economy, smart environment, smart mobility, and smart governance – as highly correlated with the Smart City concept. However, a divergence was observed in the perception of the smart economy dimension. While individuals aged 31 years and above rated it as highly correlated, those aged 18 to 30 saw it as only moderately correlated, indicating a generational difference in the perceived impact of economic factors on the Smart City vision. Regarding educational levels, individuals with a bachelor's degree or higher and those with a diploma or less perceived the smart mobility dimension as highly correlated with the Smart City concept. This suggests a broad consensus on the importance of mobility within the Smart City framework, regardless of educational background. These findings highlight varying perceptions based on employment status, age, and education, underscoring the need for tailored strategies in Smart City development to address diverse community perspectives.

The results indicate notable differences in how various demographic factors influence the perceived importance of the Smart City dimensions. Employed individuals rated all six Smart City dimensions as highly important, suggesting a strong alignment between their employment status and the perceived value of these initiatives. This may reflect greater awareness or direct benefit from Smart City developments in their professional lives. In contrast, non-employed individuals saw these dimensions as only moderately necessary, indicating a less pronounced perception of their importance. However,

both groups rated the smart governance dimension as highly important. This shared perception highlights the universal value of effective governance in the Smart City framework, regardless of employment status. The importance of four dimensions – smart economy, smart environment, smart mobility, and smart living – was rated highly by both younger (18 to 30) and older individuals (31 years and above). This suggests a broad consensus on the significance of these dimensions across age demographics. However, the uniform high rating indicates that while all age groups recognise their importance, there may be variations in how these dimensions are prioritised or experienced daily. Individuals with a bachelor's degree or higher rated the smart people and smart economy dimensions as highly important. This suggests that those with more education may value these aspects more, potentially due to their relevance in higher-level professional and academic environments. Conversely, those with a diploma or less viewed these dimensions as only moderately necessary. This disparity may reflect differences in how education levels influence perceptions of the role and impact of these dimensions in their personal or professional lives.

Notwithstanding the valuable insights gained into public perceptions of Smart City dimensions in Kuwait, limitations regarding the sample's representativeness should be acknowledged. The use of a voluntary online survey may have resulted in the overrepresentation of certain demographic groups, particularly younger, more educated, and digitally literate individuals, which could have influenced reported levels of awareness, interest, and engagement. Although comprehensive national demographic data were not available for direct comparison, the variations observed across age, education, and employment status indicate that the sample may not fully represent the wider Kuwaiti population. As such, caution is advised when generalizing the findings. Future studies should consider adopting a more stratified sampling strategy and incorporating broader demographic indicators to enhance representativeness and deepen insights into public perceptions across diverse population segments.

## **LIMITATIONS AND FUTURE RESEARCH**

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This study has several limitations, particularly in its sample size and procedure, which limit the generalizability of the findings. With only 434 fully completed surveys collected through non-probability sampling, the sample may not accurately reflect national trends, making it challenging to apply the results to the broader population in Kuwait. To enhance the generalizability of the findings, a larger-scale survey conducted over a more comprehensive geographical range would be beneficial. Another limitation of this study is its reliance on a single model with six smart city dimensions. This excludes other models that might encompass additional dimensions. Future research should explore alternative models and dimensions to provide a more comprehensive understanding of smart cities.

## **CONCLUSIONS, IMPLICATIONS, AND RECOMMENDATIONS**

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The study aimed to explore public perceptions of the smart city concept in Kuwait and assess their understanding of its features and dimensions. A quantitative study was conducted to achieve the study objectives. The results revealed that just under half of the participants had some understanding of Smart Cities, indicating moderate community awareness. More than a third of those who were aware believe their city is actively working towards becoming a Smart City. More than half of the respondents are unaware of the Smart City concept, highlighting a significant knowledge gap. Among the unaware, more than a quarter believe local authorities have made efforts to inform the public. However, over three-quarters of respondents are interested in learning more about Smart Cities, and two-thirds are keen to participate in city development decisions through a digital platform. The results show that respondents strongly associate the six key dimensions with the Smart City concept. All six dimensions are also considered highly important and are ranked in the following order of significance: smart governance, smart mobility, smart environment, smart living, smart economy, and

smart people. The results reveal varied levels of activity in these dimensions. The most frequently observed activities were in smart people, smart economy, and smart living, while the least observed activities were in smart governance, smart environment, and smart mobility. The results highlighted diverse needs for improvement across the six Smart City dimensions. While the most frequently cited areas for enhancement are smart environment, smart living, and smart mobility, it is essential to note that the least commonly identified areas for improvement are smart people, smart economy, and smart governance. The results reveal notable variations in the perceived importance of the Smart City dimensions and their correlations with the Smart City concept, depending on employment status, age, and education.

Considering the above results, this study has several implications and recommendations. First, local authorities should enhance communication strategies to boost awareness of Smart City initiatives. This can be done through public workshops, informative campaigns, and leveraging digital platforms. Efforts should aim to bridge the knowledge gap between those aware and unaware of Smart City projects by ensuring transparency and clearly explaining the benefits. With a robust public interest in learning and participation, authorities should offer educational programs and platforms for civic engagement, using interactive online tools to foster community involvement.

Second, the high ratings across all six Smart City dimensions indicate a community preference for a holistic development approach, focusing on smart mobility, living, and environmental sustainability. Authorities should prioritise these areas, ensuring public understanding and support are maintained through comprehensive engagement and education. Integrated plans considering the interconnected nature of all dimensions are crucial to creating an efficient and cohesive Smart City ecosystem.

Third, it is essential to note that some Smart City initiatives may lack visibility, as varied activity levels suggest. To address this, authorities should enhance communication and public awareness campaigns, ensuring that all dimensions are equally recognised and supported. This is crucial for ensuring balanced and effective Smart City development. Activities in the smart governance, environment, and mobility dimensions require more focus and resources. Authorities can introduce pilot projects or public demonstrations to make these initiatives more noticeable and impactful, ensuring balanced and effective Smart City development.

Fourth, the high frequency with which smart environments and smart living are cited for improvement underscores the community's strong focus on sustainability and quality of life. Authorities should focus on projects that enhance environmental sustainability, such as green infrastructure and renewable energy, and improve healthcare, safety, and housing. Smart mobility is also a significant concern, requiring accelerated efforts to enhance transportation systems. Although other dimensions like smart people, economy, and governance have lower improvement ratings, they still need attention. Authorities should communicate progress across all dimensions, engaging the community through various channels to gather feedback and raise awareness.

Fifth, the variations in perceived correlations between the Smart City dimensions and the Smart City concept suggest several implications for policy and planning. Authorities could implement pilot programs or community forums tailored to specific age groups, education levels, and employment statuses to gather feedback and adjust strategies. Tailored communication can improve engagement, highlighting the universal benefits of smart governance while addressing the broader impacts of other dimensions. Understanding how different age demographics value certain dimensions can help design targeted initiatives. Similarly, recognising that individuals with higher education place more importance on certain dimensions can guide educational campaigns, while strategies to boost awareness among those with lower education levels can help balance perceptions. These tailored approaches can enhance community engagement and support for Smart City initiatives.

Finally, while there is broad agreement on the importance of several Smart City dimensions, demographic factors such as employment status, age, and education level influence how these dimensions are perceived. Addressing these variations through tailored strategies can enhance overall community

engagement and support for Smart City initiatives. For employed individuals, emphasise how Smart City initiatives impact their work and offer professional development opportunities. For non-employed individuals, increase awareness of how these initiatives can improve daily life with targeted outreach programs. Engage younger individuals (18-30) by integrating innovative technologies and offering involvement opportunities like internships. In comparison, for older individuals (31+), focus on improvements in quality of life such as healthcare and safety. Highlight advanced aspects of Smart City dimensions, like the smart economy, for those with higher education through academic partnerships and seminars, and simplify communication for those with lower education levels, focusing on practical benefits. Smart governance should be a key communication focus, showcasing successful projects and participatory governance. Increase visibility through targeted campaigns and visible projects for lower-rated dimensions, ensuring balanced investment and communication across all dimensions. Regular updates on progress will reinforce their importance and support effective and inclusive Smart City development.

It is important to note that the sample was primarily composed of younger, highly educated, and digitally literate individuals, which may have influenced the overall patterns observed in this study – particularly the high levels of awareness, interest, and engagement with Smart City initiatives. As a result, caution should be exercised in generalizing the findings to the broader Kuwaiti population. Future studies are encouraged to adopt more representative sampling strategies to capture a wider spectrum of public perceptions.

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