SILESIAN UNIVERSITY OF TECHNOLOGY PUBLISHING HOUSE

SCIENTIFIC PAPERS OF SILESIAN UNIVERSITY OF TECHNOLOGY 2026
ORGANIZATION AND MANAGEMENT SERIES NO. 248

THE IMPACT OF CULTURAL CONTEXT ON EFFECTIVE SMART CITY MANAGEMENT: AN ANALYSIS OF THE OXFORD ECONOMIC GLOBAL CITIES INDEX

Aleksandra RADZISZEWSKA

Czestochowa University of Technology, Faculty of Management; aleksandra.radziszewska@pcz.pl,
ORCID: 0000-0002-6390-9487

Purpose: This study seeks to investigate the intricate relationships between the cultural dimensions articulated by Hofstede and the efficacy of smart city management in relation to a city's standing in the global smart cities ranking as determined by the Oxford Economic Global Cities Index 2025.

Design/methodology/approach: Multiple regressions were employed to explore the relationship between the independent variables, cultural dimensions as defined by Hofstede, including power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation, and the dependent variable, which is the value of the Oxford Economic Global Cities Index 2025. The Oxford Economic Global Cities Index was chosen for its timely and thematic significance, as it captures the current outcomes of several key indicators relevant to a city's development. Smart Cities were selected based on their rankings within the Oxford Economic Global Cities Index 2025.

Findings: This study demonstrates that elevated levels of long-term orientation and individualism, coupled with low uncertainty avoidance, positively impact the adoption of smart city solutions. In contrast, the anticipated relationships between power distance and the adoption of smart city solutions, as well as masculinity and the adoption of these solutions alongside effective smart city management, were not substantiated and warrant further examination. The proposed connections between specific dimensions of national culture and effective smart city management are pertinent to the cities featured in the Oxford Economic Global Cities Index 2025.

Research limitations/implications: The primary limitation of this study is the relatively small number of cities included in the analysis. Additionally, there is a lack of a comprehensive metric that encompasses all aspects of the smart city management process. Nevertheless, the research has partially fulfilled its main objective by demonstrating that the proposed relationships between specific dimensions of national culture and the adoption of smart city solutions are valid for the cities featured in the Oxford Economic Global Cities Index 2025. Conversely, the study has also prompted new enquiries regarding the connection between masculinity and power distance, as well as their impact on smart city management, indicating a need for further research.

Originality/value: The existing literature exhibits a notable deficiency in addressing the cultural determinants inherent in the management of smart cities, particularly regarding the organisational and managerial solutions necessary for the transition from traditional urban

frameworks to smart city paradigms. This paper endeavours to critically examine the influence of cultural factors on urban management and development processes. The impetus for this study lies in investigating the relationship between Hofstede's cultural dimensions and the extent of technological adoption within the realm of smart city management, alongside their subsequent impact on a city's standing in global smart city rankings.
Keywords: smart city management, smart city, cultural dimensions, cultural context, the Oxford Economic Global Cities Index.
Category of the paper: research paper.

1. Introduction

The concept of the smart city represents a transformative paradigm in urban planning, emergent from the dynamics of the contemporary digital era. Smart cities, fueled by rapid advancements in information and communication technology (ICT), offer innovative solutions to a myriad of complex urban challenges.

The adoption of smart city technologies is significantly shaped by both national and local cultural dimensions, which influence organisational strategies and citizen engagement practices. A comprehensive understanding of these cultural determinants is crucial for policymakers and city managers, as it allows for the tailoring of interventions aimed at enhancing both adoption rates and equitable outcomes.

National culture has long been considered a contextual factor influencing economic behaviour, including innovation. Scholars have argued that the values of innovation are increasingly recognised as influenced by not only technological infrastructure and economic policy but also deeper cultural values embedded in a society. While traditional innovation studies have emphasised factors such as research and development intensity, education, and market structure, a growing body of research highlights that national culture can significantly shape a country's capacity to innovate (Escandon-Barbosa et al., 2022; Bonetto et al., 2022; López-Cabarcos et al., 2021; Tian et al., 2021).

Culture, defined as a system of beliefs, attitudes, and values (Hofstede, 2001), plays a pivotal role in the manner in which societies respond to contemporary challenges. Geert Hofstede's cultural dimensions theory serves as the predominant framework for conducting cross-cultural analyses of national culture. Hofstede identifies the following cultural dimensions: power distance, uncertainty avoidance, individualism vs. collectivism, masculinity vs. femininity, and long-term vs. short-term orientation. His research underscores the assertion that national culture significantly influences the values and behaviours of a nation's citizens. While a substantial body of literature has explored the relationship between national culture and organisational behaviour, there remains a notable dearth of studies examining the role of national culture within the context of urban resilience.

Consequently, the existing body of knowledge concerning the reflection of national culture in urban resilience planning is limited. This research seeks to address this gap by exploring the implications of cultural factors on urban resilience strategies.

Numerous academic papers endeavour to conceptualise and delineate the fundamental aspects and application domains of smart cities, frequently employing case studies or comparative analyses. However, it is posited that further investigation is warranted to identify successful methodologies for urbanisation and the enhancement of urban areas. Notably, the transition from conventional urban environments to smart cities has not received adequate scholarly attention to the cultural determinants that underpin smart city management, particularly in terms of organisational and managerial solutions (Jourdan, Smith, 2021; Neves, 2025; Avis et al., 2025; Fonesca et al., 2025). Thus, this study aims to elucidate how cultural elements influence urban development and the broader discipline of city management.

The motivation behind this study is to explore the relationship between Hofstede's cultural dimensions and the effective management of smart cities, as well as their influence on a city's standing in the global smart cities ranking. This study seeks to investigate the intricate relationships between the cultural dimensions articulated by Hofstede and the efficacy of smart city management in relation to a city's standing in the global smart cities ranking as determined by the Oxford Economic Global Cities Index 2025.

The structure of the paper is as follows: following this introduction, the next section provides a literature review, which includes a discussion of the research model and the development of hypotheses. The research methodology is elaborated upon in detail. Lastly, the research findings are presented and discussed, the implications examined, and the limitations and avenues for future research identified.

2. Literature review and hypotheses development

The concept of smart cities has undergone a significant evolution, initially characterised by the integration of advanced technologies such as sensors, high-speed internet infrastructure, and big data analytics platforms (Angelidou et al., 2018; Özdoğan et al., 2025; Audretsch et al., 2025). Over time, this paradigm has expanded to encompass a more comprehensive understanding, prioritising the enhancement of overall societal quality of life (Albino et al., 2019; Kinoshita et al., 2025; Palgan, Mont, 2025). The continuous advancement of technological innovations provides new avenues for the management of urban development. In contemporary society, the transformation of urban spaces into smart cities is increasingly recognised as an essential strategy for elevating residents' quality of life. The overarching objective of the smart city framework is to implement modern urban management practices utilising technological instruments (Wang, Zhou, 2022; Intan, Junita, 2025).

As urban areas increasingly digitalise, they are experiencing substantial migration flows from rural regions, as individuals seek improved living conditions and economic opportunities. According to Dastbaz, Naudé, and Manoochehri (2018), the anticipated urban population surge by 2050 is projected to be most pronounced in developing nations, underscoring the critical need for effective management strategies. This necessitates meticulous planning for the requisite infrastructure and services to accommodate the escalating population. Hence, a smart city may be precisely defined as an urban environment that leverages information and communication technology (ICT) to optimise its operational effectiveness (Okafor et al., 2023).

The impact of cultural variables on the adoption of emerging technologies has garnered considerable attention from scholars (Khan, 2022; Blut et al., 2022; Venkatesh, 2022). In particular, research that employs and validates Hofstede's national cultural dimensions illustrates that these constructs hold substantial relevance, with observable variations in national cultures significantly influencing diverse organisational behaviours and outcomes (Bresciani et al., 2021; Tekic, Tekic, 2021; Yeganeh, 2023).

Geert Hofstede, a Dutch sociologist, conceptualises culture as a "collective programming of the mind," which directs how a group interacts with its environment (Hofstede, 1991). His framework is widely recognised as a robust analytical tool for examining technology adoption in smart city governance due to its extensive application in the academic literature. Hofstede's original model encompassed four primary cultural dimensions: power distance, uncertainty avoidance, individualism, and masculinity, with a subsequent fifth dimension, long-term orientation, added later. Each dimension, along with its anticipated relationship to ICT adoption and smart city management, warrants careful consideration (Kole, 2025).

The first dimension identified by Hofstede (1980), power distance, relates to the extent of accepted inequality among individuals within a given culture. Hofstede (2001) articulates power distance as society's acceptance of disproportionate power distribution. Cultures exhibiting low power distance indicate a greater acceptance of hierarchical structures, whereas those with high power distance suggest a societal dissatisfaction with inequalities in power.

Power distance reflects the degree of inequality deemed acceptable within a country and is manifest in organisational hierarchies. Cultures characterised by elevated power distance are often less amenable to novel ideas due to the involvement of decision-making in areas lacking historical precedent and sufficient information (Lee, Peterson, 2000). Conversely, low power distance cultures typically exhibit minimal inequality, wherein societal perceptions do not regard discrepancies in power, wealth, and prestige as inevitable (Oyserman, 2006). Nikolov and Krumova (2019) assert that power distance serves as a strong predictive factor, particularly within European nations, in relation to specific aspects of e-governance in smart cities.

Power distance denotes the extent to which a society acknowledges formal power and status differentials among its members (Van Everdingen, Waarts, 2003). In cultures characterised by lower power distance, individuals are inclined to question established norms, procedures, and authoritative figures. Hofstede (2011) posits that societies with diminished power distance

are more inclined to adopt new technologies and foster innovative practices. In contrast, high levels of centralisation and formalisation tend to correlate negatively with the rates of innovation adoption (Rinne, Steel, and Fairweather, 2012). Thus, the first hypothesis of this inquiry can be articulated as follows:

H1: *Smart city management is positively impacted by low power distance.*

In this hypothesis, it is posited that a diminished level of power distance within organisational structures can positively influence the efficacy of smart city management. This framework emphasises collaborative governance and participatory decision-making, thereby fostering an environment where the voices of diverse stakeholders, including citizens, are duly recognised and valued. Such inclusive practices are expected to enhance transparency, responsiveness, and innovation within smart city initiatives, ultimately contributing to improved outcomes in urban development.

The constructs of individualism and collectivism represent a spectrum that reflects varying degrees to which societies endorse self-reliance over group integration. A high score on this continuum signifies a societal preference for individualism, whilst a low score indicates a tendency towards collectivism. This spectrum illustrates cultural orientations toward either individual pursuits or communal pursuits. Societies characterised by individualism typically favour individuals who demonstrate independence, whereas collectivist societies underscore the importance of mutual support and loyalty to the community.

In individualistic societies, individuals are encouraged to act autonomously, question authority, and take initiative, traits that align with entrepreneurship and knowledge creation. Individualism reflects the extent to which a society allows gratification and enjoyment while playing a facilitating role (Escandon-Barbosa et al., 2022).

Research conducted by Lee et al. (2007) establishes a positive correlation between individualism and technology acceptance, while subsequent studies by Tarhini et al. (2017) highlight that individualism not only fosters readiness for technology adoption but also mediates other cultural dimensions. Furthermore, Masimba, Appiah, and Zuva (2019) have confirmed a significant relationship between individualistic orientations and technology adoption rates.

In individualistic societies, there exists a heightened emphasis on personal goals. Shane (1993) notes that these societies exhibit enhanced levels of innovation. Additional empirical evidence suggests that cultures classified as individualistic are more inclined to adopt technologically innovative solutions. A positive correlation is also identified between elevated individualism and indicators of innovation (Rinne, Steel, Fairweather, 2012). Consequently, it can be anticipated that societies with stronger individualistic orientations are likely to exhibit greater levels of innovation (Khazanchi et al., 2007). Recent studies indicate that greater individualism among urban populations correlates with greater efficacy in managing smart cities. Individualism is posited to stimulate innovative thinking and personal accountability,

both of which are essential attributes in the development and implementation of smart technologies and urban policies.

As citizens engage more actively in their communities, their unique perspectives and contributions may yield more adaptive and responsive governance structures, ultimately resulting in improved outcomes for smart city initiatives. This relationship underscores the importance of cultivating individualistic values in the promotion of collaborative, technology-driven urban environments (Marchesani, 2023).

The dimension of individualism pertains to the dynamics between individuals and their respective groups. In individualistic cultures, individuals are more inclined to make autonomous decisions, while those in collectivist contexts are often more susceptible to conforming to group norms. A heightened degree of individualism is associated with a greater openness to novel digital solutions and citizen-centric services within smart city initiatives. Individualistic societies prioritise personal benefit and innovation, thereby enhancing the adoption of technology. Individuals in these societies feel empowered to voice their opinions, making them more inclined to innovate and embrace new concepts. Thus, individuals within individualistic cultures often exhibit self-reliance and independent thinking, which is anticipated to foster creativity and, by extension, heightened levels of innovation (Dirsehan and Zoonen, 2022). In light of this comprehension, the second hypothesis posited in this study is articulated as follows:

H2: *Smart city management is positively impacted by a higher degree of individualism.*

The dichotomy of masculinity versus femininity serves as a critical framework for understanding how various societies prioritise distinct values traditionally associated with gender. Masculinity is characterised by a preference for values such as economic growth, power, and high achievement, whereas femininity emphasises values like care, cooperation, and the cultivation of harmonious environments. In this context, high scores on masculinity indicate a societal inclination towards competitive and performance-driven norms, while low scores reflect an affinity for cooperative and relationship-oriented principles.

Cultures that exhibit a strong masculine orientation are often marked by ambition and a pronounced focus on material success. In contrast, feminine cultures typically prioritise solidarity, equality, and consensus-building, thereby fostering social relationships and communal well-being. According to Hofstede (2001), organisations operating within masculine frameworks tend to prioritise performance-related rewards and recognition, alongside individual training and development – a combination that is frequently linked to innovative organisational characteristics.

Moreover, gender-role-related behaviours effectively illustrate masculinity as a significant cultural dimension. Societies classified as masculine often demonstrate lower levels of gender egalitarianism and are more steadfastly focused on achievement metrics. Conversely, feminine cultures demonstrate a heightened emphasis on relational dynamics. Research indicates that cultures with a feminine orientation are generally more supportive of the adoption of new

technologies, as they are influenced by subjective norms and positive behavioural intentions (Tarhini et al., 2017).

On the other hand, Sunny, Patrick, and Rob (2019) attest that masculine societies may tend to negative attitudes towards technological innovations. Nonetheless, Negara and Setyohadi (2020) contend that masculinity alone may not serve as a definitive predictor of technology acceptance, particularly concerning smart city initiatives. Additional research conducted by Meyer-Waarden et al. (2021) suggests that femininity plays a moderating role in uncertainty avoidance, thus enhancing trust in smart solutions that promote individuals' subjective well-being. Whereas masculinity often undermines collaboration and social openness, which are crucial for long-term innovation success (Prim et al., 2017).

In summary, Hofstede (2001) posits that organisations within masculine cultures are predominantly orientated towards performance recognition and rewards, alongside individual development, traits commonly associated with innovation. Therefore, this study proposes a positive correlation between masculinity and the propensity for innovation within smart city management contexts.

H3: *A higher level of masculinity has a positive influence on smart city management.*

Uncertainty avoidance is a critical cultural dimension that delineates the extent to which societies endeavour to mitigate unpredictability in their environments. A society exhibiting a high score on this dimension typically places a premium on tradition and established norms over innovative practices, whereas a society with a low score demonstrates a preference for pragmatic approaches that prioritise functional implementation over stringent adherence to established principles. The integration of new technologies inherently entails a degree of uncertainty, which is particularly pronounced in contexts where the functionality of such technologies is validated, but their economic viability remains contentious (Stoneman, 2001). This underscores the significance of economic risk as a primary concern in the adoption of technology.

The concept of uncertainty avoidance reflects individuals' inherent desires for structured and regulated environments. An excessively high level of uncertainty avoidance is often indicative of a society characterised by anxiety and a striving mentality, in contrast to societies with lower scores, which tend to exhibit greater adaptability and a more laid-back disposition. Venkatesh and Zhang (2010) evidenced that the process of adopting new technology can engender a state of uncertainty, culminating in heightened perceived stress and discomfort within cultures characterised by elevated levels of uncertainty avoidance. Furthermore, research conducted by Negara and Setyohadi (2020) identified uncertainty avoidance as a robust predictor of technology acceptance, particularly in the context of smart city initiatives. Supporting this premise, studies by Meyer-Warden et al. (2021) reveal that individuals originating from cultures with high uncertainty avoidance manifest heightened anxiety when confronted with transformative changes and the introduction of novel technologies, accompanied by an increased need for control.

Consequently, uncertainty avoidance emerges as a vital dimension that differentiates societies based on their propensity to embrace risk. According to Hofstede (2011), cultures marked by low levels of uncertainty avoidance exhibit a greater willingness to engage in risk-taking behaviours and to entertain divergent viewpoints, both of which are instrumental in fostering the processes of innovation and the adoption of new technologies. In contrast, societies characterised by high uncertainty avoidance demonstrate a pronounced reluctance to experiment with unproven solutions in the realm of smart city initiatives. Populations that are risk-averse often require substantial assurances regarding privacy, security, and reliability before consenting to the adoption of such innovations. Therefore, the fourth hypothesis of this study can be articulated as follows:

H4: *A lower level of uncertainty avoidance positively impacts the effectiveness of smart city management.*

Long-term orientation represents a significant cultural dimension that encompasses a multifaceted understanding of temporal perspectives, integrating considerations of the past, present, and future. Cultures characterised by long-term orientation exhibit a societal time perspective influenced by enduring cognitive frameworks, wherein technology and situational evaluations are grounded in both present and prospective implications, rather than exclusively prioritising immediate, short-term outcomes (Van Everdingen, Waarts, 2003). This dimension of long-term orientation pertains to the value a culture places on its traditions and the degree to which it emphasises historical and future considerations.

Fundamentally, long-term orientation is intricately linked to societal pragmatism, as contrasted with a proclivity for traditionalism. A high score on the long-term orientation scale indicates a cultural predisposition towards pragmatic problem-solving approaches that transcend mere adherence to tradition and social norms. This cultural orientation is also associated with attributes such as frugality, perseverance, the cultivation of enduring relationships, and the prioritisation of future rewards (Chopdar, Sivakumar, 2019). Moreover, according to Tran Le Na and Hien (2021), long-term orientation exerts a positive influence on the functional, social, and emotional values attributed to emerging technologies, thus fostering technology acceptance.

Van Everdingen and Waarts (2003) analysed the relationship between national culture and the adoption of innovations and new technologies through the lens of Hofstede's dimensions. Their findings reveal that cultures exhibiting higher degrees of long-term orientation tend to demonstrate increased receptivity to the adoption of innovations and novel technologies. In this context, cultures with elevated long-term orientation scores emphasise traditional values to a greater extent than those with lower scores. Consequently, cultures marked by low long-term orientation often assign diminished significance to tradition, thereby demonstrating greater openness to novel concepts. This phenomenon suggests that the rate of technology adoption is expected to be higher in nations with a lower long-term orientation compared to those where a more pronounced long-term orientation is prevalent. Long-term orientation has been

associated with innovation through a focus on future-oriented investment, persistence, and adaptive change. It supports strategic patience and planning -two critical attributes in building innovation infrastructure (Celikkol et al., 2019).

Furthermore, societies that score high on long-term orientation are inclined to invest significantly in sustainable, future-oriented smart city infrastructures, such as Internet of Things (IoT)-based environmental monitoring systems and predictive analytics. This propensity leads to a higher adoption rate of such solutions. Accordingly, the following hypothesis emerges from this analysis:

H5: *A higher level of long-term orientation has a positive influence on smart city management.*

Culture significantly influences the management of smart cities, as demonstrated by numerous studies. This impact arises from culture's ability to foster either a conducive or a challenging environment for innovation. Smart cities should prioritise enhancing the quality of life alongside improving the efficiency and quality of services provided by government entities and businesses (Mutambik, Almuqrin, 2024). As smart cities emerge as a solution to challenges posed by urban population growth and rapid urbanisation, understanding Hofstede's cultural dimensions becomes crucial for effective management. This understanding enables the implementation of technology solutions that are widely accepted, equitable, and sustainable. By customising strategies across Hofstede's five dimensions—power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation—cities can convert generic rollouts into culturally relevant initiatives that actively engage stakeholders at all levels. Tailoring strategies to each dimension enhances the effectiveness of technology adoption and promotes sustainability.

3. Materials and methods

The presented study was conducted in September and October 2025. Its purpose was to determine the relationship between culture dimensions defined by Hofstede and the effectiveness of smart city management in the form of the city’s position in the global smart cities ranking – the Oxford Economic Global Cities Index.

Multiple regressions were used to identify the relationship between the independent variables - value of Hofstede’s culture dimensions: power distance, individualism, masculinity, uncertainty avoidance, and long-term orientation (https://www.hofstede-insights.com/country-comparison-tool) and the dependent variable – value of the Oxford Economic Global Cities Index (https://www.oxfordeconomics.com/global-cities-index/).

This index contains five categories: Economics, Human Capital, Quality of Life, Environment, and Governance, which are aggregated to create an overall score for each city. Each category comprises multiple indicators (four to six, depending on the category), which aim to address some of the most important considerations within their respective categories. As a result, the Global Cities Index provides a more complete comparison of cities by ranking them not just on their economic performance but also considering other important factors that influence their relative strengths (https://www.oxfordeconomics.com/global-cities-index/).

A city's economy plays a crucial role in its prosperity and attractiveness. Economic vitality is a fundamental aspect of urban development, driving a city's wealth generation, employment opportunities, access to goods and services, and much more. Including economic metrics in the index acknowledges the pivotal role that the economy plays in shaping urban landscapes and driving investment. This category allows for an assessment of a city's potential for sustained growth and development, essential for any comprehensive comparison of cities around the world.

Human capital encompasses the collective knowledge and skills of a city's population, underpinning the economic potential of every city. It reflects the dynamics of educational attainment, innovation, and demographics at play across metropolitan areas. In today's knowledge-based economy, cities with diverse, highly skilled workforces and innovative businesses are better positioned to adapt to technological change and compete globally. Incorporating human capital indicators into the index emphasises the importance of people in driving economic prosperity and recognises cities that invest in education, business, and diversity.

Quality of Life encapsulates the well-being and satisfaction of a city's residents, reflecting the intersection of various socioeconomic factors. This category provides insights into the liveability and attractiveness of a city, which can play a role in migration patterns, talent retention, and the overall happiness of residents. Evaluating quality of life metrics in the index underscores the importance of urban policies that not only prioritise economic prosperity but also health, equality, and cultural vibrancy, enhancing residents' overall well-being. At the top of the Quality of Life category are cities with lower inequality and residents who live long lives. Most of them also provide residents with access to a range of recreation and cultural amenities.

The Environment category evaluates a city's commitment to environmental sustainability and its predisposition to climate change risks, critical factors for ensuring long-term resilience. Incorporating environmental metrics into the index reflects the growing recognition of the interconnectedness between economic prosperity and the natural environment, highlighting the imperative for cities to adopt climate change-conscious policies and initiatives and the hazards of not doing so.

The Governance category is measured slightly differently than the other four, in recognition of the fact that national governments-not just those at the city level-have a significant influence on these outcomes. As a result, scores in this category are calculated at the national level rather than the city level, meaning that every city in a given country is given the same score for a given indicator. Cities at the top of the Governance category have a pedigree of institutions that protect the rights of their residents and foster political stability. Governance is the basic foundation for city prosperity across the other four categories. Good governance fosters trust, social cohesion, and equitable access to opportunities, while poor governance can lead to inefficiencies, corruption, and social unrest. Including governance indicators in the index acknowledges the category's pivotal role in shaping the overall trajectory of a city, influencing policy outcomes, public services delivery, and resident protection and engagement.

After collecting data for each indicator for all cities, normalised scores were created for each indicator by assigning the highest-scoring city a score of 100 for that indicator, the lowest-scoring city a score of 0, and distributing the rest of the cities' scores across that range. The scores for each indicator within a category were combined to create a total score for that category for each city. The total scores for each category were then normalised. The city's final overall score was calculated by taking a weighted average of each category's normalised score, using the following weights: Economics – 30%, Human Capital – 25%, Quality of Life – 25%, Environment – 10%, Governance – 10% (https://www.oxfordeconomics.com/global-cities-index/).

The result is an overall score for each of the 1000 Global Cities that considers not only the city's economic performance but also how well educated it is, the well-being of its residents, the volatility of its climate, any political risks facing the city, and much more. This allows cities to be ranked in a more holistic manner and helps identify relative strengths and weaknesses for each city across the five categories.

The top cities overall in the Global Cities Index possess strong scores in all five categories. Not only do they provide important economic contributions to the global economy, but they are also hubs for education and business innovation and invest in the infrastructure necessary to maintain a high quality of life. They also prioritise policies that focus on the environment and good governance.

The Oxford Economics Global Cities Index provides a holistic assessment of the 1000 largest cities in the world. Smart Cities were selected based on their rankings in the Oxford Economics Global Cities Index 2025. The 10 cities with the highest ranking were included in the analysis. The following cities were taken into consideration: New York (United States), London (United Kingdom), Paris (France), San Jose (United States), Seattle (United States), Melbourne (Australia), Sydney (Australia), Boston (United States), Tokyo (Japan), San Francisco (United States).

4. Results and discussion

Multiple regression analysis was employed to examine the relationship between the independent variables, specifically Hofstede's cultural dimensions, and the dependent variable, the Oxford Economic Global Cities Index. The impact of cultural factors on the adoption of new technologies is increasingly recognised as a critical area for investigation by researchers (Khan, 2022; Blut et al., 2022; Venkatesh, 2022). Studies that utilise and validate Hofstede's national culture dimensions demonstrate that these constructs are both relevant and significant, indicating that variations in national cultures significantly influence a wide range of organisational and individual behaviours and outcomes across different cities. The results of the regression analysis are presented in Table 1.

Table 1.
The results of the regression analysis

Independent variables - national culture dimensions	**Standardized coefficients Beta**	**t**	**Significance level**
Low power distance	0.093	0,369	0,650
Individualism	0.481	4,243	0,000
Masculinity	0.072	0,321	0,630
Low uncertainty avoidance	0.259	3,782	0,000
Long-term orientation	0.568	4,516	0,000
Dependent variable: the Oxford Economic Global Cities Index $R^2 = 0.786$, F = 29.641, significance level = 0.01.			

Source: own study based on https://www.oxfordeconomics.com/global-cities-index/ and https://www.hofstede-insights.com/country-comparison-tool

The reliability assessment utilised in this study was Cronbach's alpha, which revealed that all research variables exceeded 0.8. This indicates a high level of internal consistency, suggesting that the measures employed are reliable and that the evaluation instrument is suitable for research purposes.

The findings indicate that the R-squared value was 0.786, demonstrating that the independent variables explain 79.8% of the variance in the adoption of smart city solutions, as measured by the Oxford Economic Global Cities Index. Furthermore, the linear relationship between Hofstede's cultural dimensions and the adoption of smart city solutions was statistically significant, with an F-value of 29.641 at the 0.01 significance level, thereby affirming the model's suitability for this study.

Analysis of individual hypotheses yielded the following results: low power distance (beta = 0.093) did not establish a statistically significant relationship with the Oxford Economic Global Cities Index, as evidenced by a significance level of 0.650, which exceeds the 0.05 threshold; therefore, Hypothesis 1 is rejected.

Conversely, the significance level for individualism related to the Oxford Economic Global Cities Index was 0.000, considerably less than 0.05, validating Hypothesis 2. The coefficient for individualism was notably substantial (beta = 0.481), thereby indicating that higher levels of individualism positively influence the adoption of innovative solutions.

Further analysis revealed that masculinity (beta = 0.072) did not demonstrate a statistically significant relationship with the adoption of smart city solutions, with a significance level of 0.630, leading to the rejection of Hypothesis 3. The significance level for low uncertainty avoidance in relation to the Oxford Economic Global Cities Index was set at 0.000, thus confirming Hypothesis 4. The beta value associated with this variable is 0.259, suggesting that a lower level of uncertainty avoidance exerts a significant positive effect on the adoption of smart city solutions.

Moreover, the significance level for long-term orientation in relation to the adoption of smart city solutions was also 0.000, confirming Hypothesis 5. This test indicated that long-term orientation possesses the highest coefficient (beta = 0.568) in comparison to other cultural dimensions, signifying its predominant positive impact on the adoption of smart city solutions.

The outcomes of this investigation yield some unexpected insights. Notably, power distance and masculinity were found to be insignificant predictors in this model. In contrast, long-term orientation, individualism, and low uncertainty avoidance emerged as the three cultural dimensions that exhibited significant correlations. As hypothesised, long-term orientation positively influences the adoption of smart city solutions and the Oxford Economic Global Cities Index. Alongside this, both low uncertainty avoidance and individualism demonstrated significant and favourable effects on the adoption of smart city solutions. Consequently, hypotheses 1 and 3 are rejected, while hypotheses 2, 4, and 5 are confirmed.

These results present a noteworthy discourse on the role of cultural dimensions in the adoption of smart city solutions. Specifically, the analysis reveals that power distance does not play a critical role in the adoption process, as its insignificance challenges the expected impact of this cultural dimension on effective smart city management. Similarly, the masculinity dimension appears to lack relevance in this context, suggesting that the values typical of masculine and feminine cultures present an uncertain influence on the adoption of smart city solutions. For instance, while masculine values such as achievement and motivation may suggest a correlation to positive outcomes in innovation adoption, feminine cultures, characterised by values of equality and cooperation, may foster a more favourable environment for the acceptance of new technologies in urban management.

In terms of long-term orientation, the study affirms that cities in nations exhibiting higher levels of this dimension realise a greater value on the Oxford Economic Global Cities Index. National cultures with pronounced long-term orientation are generally more receptive to innovative ideas and solutions, showcasing practical and problem-solving characteristics that facilitate the adoption of new technologies in urban management. The hypothesised positive relationship between uncertainty avoidance and the Oxford Economic Global Cities Index has

also been substantiated; this finding posits that risk aversion, among other factors, may influence a culture's innovation capacity and readiness to implement modern technologies.

Finally, the confirmed positive association between high levels of individualism and the adoption of smart city solutions reinforces the assertion that more individualistic societies are predisposed to embracing innovative approaches in urban management.

5. Conclusion

The findings of this study indicate that the adoption of smart city solutions is significantly influenced by cultural dimensions, specifically higher levels of individualism and long-term orientation, alongside a reduced level of uncertainty avoidance. However, the hypothesised relationships between masculinity and the adoption of smart city solutions, as well as the impact of low power distance, remain unsubstantiated and warrant further empirical investigation.

Effective management within smart cities is intricately shaped by both national and local cultural dimensions, particularly individualism, uncertainty avoidance, and long-term orientation. These dimensions play a crucial role in informing organisational strategies as well as fostering citizen engagement. A comprehensive understanding of these cultural factors equips policymakers and city managers to design interventions that not only enhance adoption rates but also promote equitable outcomes across diverse urban settings.

The study acknowledges several limitations, chief among them being the relatively small sample size of cities included in the analysis. Furthermore, there exists a lack of a holistic measurement framework that encompasses all phases of the smart city management process, potentially constraining the scope of the findings.

Despite these limitations, the research has made progress towards achieving its primary research objective by substantiating that certain relationships between selected national culture dimensions and the adoption of smart city solutions are valid, as evidenced in the cities analysed within the context of the Oxford Economic Global Cities Index 2025. Conversely, the study raises pertinent questions regarding the relationship between masculinity and power distance, as well as their respective influences on the adoption of smart city solutions, indicating an urgent need for future scholarly inquiry. One proposition for subsequent research includes expanding the sample to encompass a broader range of national cultures and analysing differing clusters of these cultures.

Future investigations should aim to explore additional variables that may affect the adoption of smart city solutions and the overall performance of city management. Subsequent studies must strive for validation of the findings by leveraging a more extensive sample. As the performance of smart cities cannot be fully elucidated through cultural dimensions alone, future research will also need to examine other elements that contribute to creating a conducive

environment for enhancing smart city management. Additionally, as this study has illustrated the presence of applicable technological solutions across the selected cities, a more comprehensive and diverse comparative analysis involving other urban areas would prove beneficial in identifying broader trends in city management practices.

References

1. Albino, V., Berardi, U., Dangelico, R.M. (2019). Smart cities: Definitions, dimensions, performance, and initiatives. *Journal of Urban Technology*, *22*(1), 3-21.
2. Almuqrin, A. (2024). Employee Acceptance of Digital Transformation: A Study in a Smart City Context. *Sustainability*, *16*, 1398.
3. Angelidou, M., Psaltoglou, A., Komninos, N., Kakderi, C., Tsarchopoulos, P., Panori, A. (2018). Enhancing sustainable urban development through smart city applications. *Journal of Science and Technology Policy Management*, *9*(2), 146-169.
4. Audretsch, D., Belitski, M., Eichler, G.M., Mickiewicz, T., Schwarz, E. (2025). City-level institutions and perceived entrepreneurial ecosystem's growth orientation. *Regional Studies*, *59*(1), 2478066.
5. Avis, G.R., Nocco, S., Zhao, A.Q., Cremaschi, M. (2025). Guiding AI-Assisted persona generation with Hofstede's cultural dimensions: a mixed-methods evaluation. *Behaviour & Information Technology*, 1-29.
6. Blut, M., Chong, A.Y.L., Tsiga, Z., Venkatesh, V. (2022). Meta-Analysis of the Unified Theory of Acceptance and Use of Technology (UTAUT): Challenging its Validity and Charting a Research Agenda in the Red Ocean. *Journal of the Association for Information Systems*, *23(1),* 13-95.
7. Bonetto, E., Pichot, N., Adam-Troian, J. (2022). The role of cultural values in national-level innovation: Evidence from 106 countries. *Cross-Cultural Research*, *56(4),* 307-322.
8. Bresciani, S., Puertas, R., Ferraris, A., Santoro, G. (2021). Innovation, environmental sustainability and economic development: Dea-bootstrap and multilevel analysis to compare two regions. *Technological Forecasting and Social Change*, *172*, 121040.
9. Bukowski, A., Rudnicki, S. (2019). Not only individualism: The effects of long-term orientation and other cultural variables on national innovation success. *Cross-Cultural Research, 53(2),* 119-162.
10. Çelikkol, M., Kitapçı, H., Döven, G. (2019). Culture's impact on entrepreneurship and interaction effect of economic development level: An 81 country study. *Journal of Business Economics and Management*, *20(4),* 777-797.

11. Chopdar, P.K., Sivakumar, V.J. (2019). Understanding continuance usage of mobile shopping applications in India: the role of espoused cultural values and perceived risk. *Behaviour & Information Technology*, *38*(1), 42-64.
12. Dastbaz, M., Naudé, W., Manoochehri, J. (Eds.) (2018). *Smart futures, challenges of urbanisation, and social sustainability*. Springer.
13. Dirsehan, T., van Zoonen, L. (2022). Smart city technologies from the perspective of technology acceptance. *IET Smart Cities*, *4*(3), 197-210.
14. Escandon-Barbosa, D., Ramirez, A., Salas-Paramo, J. (2022). The effect of cultural orientations on country innovation performance: Hofstede cultural dimensions revisited? *Sustainability, 14(10),* 5851.
15. Fonseca, L., Domingues, J.P., Lima, V., Dima, A.M., Busu, M. (2025). Digital futures, sustainable outcomes: Mapping the impact of digital transformation on EU SDG progress. *Sustainable Development*.
16. Hofstede, G. (2001). *Cultures and Organizations. Software of the Mind*, London: McGraw-Hill.
17. Hofstede, G. (1980). Culture and organizations. *International Studies of Management & Organization*, *10(4),* 15-41.
18. Hofstede, G. (2011). Dimensionalizing cultures: The Hofstede model in context. *Online Readings in Psychology and Culture, 2(1),* 1-26.
19. https://www.hofstede-insights.com/country-comparison-tool
20. https://www.oxfordeconomics.com/global-cities-index/
21. Intan, L.N., Junita, R. (2025). Barriers and Breakthroughs: Assessing Smart Governance Adoption for Bureaucratic Reform in a Developing City. *KnE Social Sciences*, *10*(30), 347-359.
22. Jourdan, L., Smith, M. (2021). National culture dimensions as predictors of innovation, creativity, and entrepreneurship. *Journal of Global Business Insights*, *6(2),* 154-171.
23. Kaasa, A., Vadi, M. (2010). How does culture contribute to innovation? Evidence from European countries. *Economics of Innovation and New Technology*, *19(7),* 583-604.
24. Khan, S. (2022). Barriers of big data analytics for smart cities development: a context of emerging economies. *International Journal of Management Science and Engineering Management*, *17*(2), 123-131.
25. Khazanchi, S., Lewis, M., Boyer, K. (2007). Innovation-supportive culture: The impact of organizational values on process innovation. *Journal of Operations Management*, *25(4),* 871-884.
26. Kinoshita, S., Furukawa, S., Ikkatai, Y., Yokoyama, H.M. (2025). Cross-National Ethical Concerns Toward AI-Based Well-Being Measurement: A Comparative Study Across Finland, Germany, Japan, and the United States Using the Octagon Framework. *International Journal of Human–Computer Interaction*, 1-23.

27. Kole, J.K.T. (2025). Applying Hofstede's cultural dimensions in education: Insights, critiques, and implications for diverse classrooms. *Open Journal of Social Sciences*, *13(5),* 94-110.
28. Lee, I., Choi, B., Kim, J., Hong, S.J. (2007). Culture-technology fit: Effects of cultural characteristics on the post-adoption beliefs of mobile Internet users. *International Journal of Electronic Commerce*, *11(4),* 11-51.
29. Lim, Y., Edelenbos, J., Gianoli, A. (2024). What is the impact of smart city development? Empirical evidence from a Smart City Impact Index. *Urban Governance*, *4*(1), 47-55.
30. López-Cabarcos, M.ª, Piñeiro-Chousa, J., Quiñoa-Piñeiro, L., Santos-Rodrigues, H. (2021). How can cultural values and entrepreneurship lead to the consideration of innovation-oriented or non-innovation-oriented countries? *Sustainability*, *13(8),* 4257.
31. Marchesani, F. (2023). Geographic Patterns in Smart City Implementation. In: *The Global Smart City* (pp. 55-74). Emerald Publishing Limited.
32. Masimba, F., Appiah, M., Zuva, T. (2019). A review of cultural influence on technology acceptance. In: *2019 International Multidisciplinary Information Technology and Engineering Conference (IMITEC)* (pp. 1-7). IEEE.
33. Meyer-Waarden, L., Cloarec, J., Adams, C., Aliman, D.N., Wirth, V. (2021). Home, sweet home: How well-being shapes the adoption of artificial intelligence-powered apartments in smart cities. *Systèmes d'information et management*, *26*(4), 55-88.
34. Mutambik, I. (2024). Culturally Informed Technology: Assessing Its Importance in the Transition to Smart Sustainable Cities. *Sustainability*, *16*, 4075.
35. Mutambik, I., & Almuqrin, A. (2024). Employee Acceptance of Digital Transformation: A Study in a Smart City Context. *Sustainability*, *16*(4), 1398.
36. Negara, J.G.P., Setyohadi, D.B. (2020). Uncertainty avoidance and individualism collectivism on acceptance of smart city mobile applications. In: *2020 4th International Conference on Informatics and Computational Sciences (ICICoS)* (pp. 1-6). IEEE.
37. Neves, C., Oliveira, T., Karatzas, S. (2025). Understanding sustainable technologies use: The role of empowerment and cultural dimensions. *International Journal of Information Management Data Insights*, *5*(2), 100375.
38. Nikolov, H.S., Krumova, M. (2019). Hofstede's model in the context of e-government and open government in EU countries: countries clustering based on similarities and differences. *Smart Cities and Regional Development (SCRD) Journal, 3*(1). Universal Academic Publishing House, 29-46.
39. Okafor, C.C., Aigbavboa, C., Thwala, W.D. (2023). A bibliometric evaluation and critical review of the smart city concept–making a case for social equity. *Journal of Science and Technology Policy Management*, *14(3),* 487-510.
40. Oyserman, D. (2006). High power, low power, and equality: Culture beyond individualism and collectivism. *Journal of Consumer Psychology*, *16(4),* 352-356.

41. Özdoğan, B., Dirik, D., Kahraman, A. (2025). The role of the city in the innovative software entrepreneurship ecosystem: a qualitative study. *Journal of Global Entrepreneurship Research*, *15*(1), 8.
42. Palgan, Y.V., Mont, O. (2025). Municipal governance of the sharing economy sectors: global insights. In: *Understanding the Urban Sharing Economy* (pp. 173-209). Edward Elgar Publishing.
43. Prim, A.L., Filho, L.S., Zamur, G.A.C., Di Serio, L.C. (2017). The relationship between national culture dimensions and degree of innovation. *International Journal of Innovation Management, 21(1),* 1730001.
44. Rinne, T., Steel, G., Fairweather, J. (2012). Hofstede and Shane revisited: The role of power distance and individualism in national-level innovation success. *Cross Cultural Research*, *46(2),* 91-108.
45. Shane, S. (1993). Cultural influences on national rates of innovation. *Journal of Business Venturing*, *8(1),* 59-73.
46. Sunny, S., Patrick, L., Rob, L. (2019). Impact of cultural values on technology acceptance and technology readiness. *International Journal of Hospitality Management*, *77*, 89-96.
47. Tarhini, A., Hone, K., Liu, X., Tarhini, T. (2017). Examining the moderating effect of individual-level cultural values on users' acceptance of E-learning in developing countries: a structural equation modeling of an extended technology acceptance model. *Interactive Learning Environments*, *25*(3), 306-328.
48. Tekic, A., Tekic, Z. (2021). Culture as antecedent of national innovation performance: Evidence from neo-configurational perspective. *Journal of Business Research*, *125*, 385-396.
49. Tian, M., Deng, P., Wu, B. (2021). Culture and innovation in the international context: A literature overview. *Innovation: The European Journal of Social Science Research*, *34(4),* 426-453.
50. Tran Le Na, N., Hien, N.N. (2021). A study of user's m-wallet usage behavior: The role of long-term orientation and perceived value. *Cogent Business & Management*, *8(1),* 1899468.
51. Van Everdingen, Y., Waarts, E. (2003). The effect of national culture on the adoption of innovations. *Marketing Letters*, *14(3),* 217-232.
52. Van Everdingen, Y., Waarts, E. (2003). The influence of national culture on the adoption status of innovations: An empirical study of firms across Europe. *European Management Journal*, *23(6),* 601-610.
53. Venkatesh, V. (2022). Adoption and use of AI tools: a research agenda grounded in UTAUT. *Annals of Operations Research*, *308*(1), 641-652.
54. Venkatesh, V., Zhang, X. (2010). Unified theory of acceptance and use of technology: US vs. China. *Journal of Global Information Technology Management*, *13*(1), 5-27.
55. Wang, M., Zhou, T. (2022). Understanding the dynamic relationship between smart city implementation and urban sustainability. *Technology in Society*, *70*, 102018.

56. Woodside, A., Lars, I., Graham, F. (2020). Consequences of national cultures and motivations on entrepreneurship, innovation, ethical behavior, and quality of life. *Journal of Business & Industrial Marketing*, *35(1),* 40-60.
57. Yeganeh, H. (2023). Culture and innovation: A human emancipation perspective. *International Journal of Sociology and Social Policy*, *43(11/12),* 980-1007.