

Journal of Urban Management and Energy Sustainability (JUMES)

Homepage: <http://www.ijumes.com>



ORIGINAL RESEARCH PAPER

The contexts for realizing Iranian smart city; a study based on meta-synthesis

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ARTICLE INFO

Article History:

Received 2024-04-05

Revised 2024-06-28

Accepted 2024-07-27

Keywords:

Iran, Meta-synthesis, MAXQDA, Managerial-institutional infrastructures, Smart city.

ABSTRACT

In recent years, rapid urbanization has led to the emergence of smart cities, which aim to enhance ecological sustainability, economic prosperity, and overall quality of life. This study investigates and analyzes the contexts of realizing smart cities in Iran using a meta-synthesis approach. After screening 216 papers, 55 were selected based on rigorous criteria and using the critical appraisal skills program. Subsequently, the final papers with a special focus on the research question were coded through MAXQDA Software. In this research, 959 codes were identified through the data extraction process. The subsequent analysis identified eight key categories, including 'developing a native model of smart city,' with 38 codes, 'Information and communications technology infrastructures,' with 113 codes, 'managerial-institutional infrastructures,' with 301 codes, 'capacity building in knowledge-based and innovative sectors,' with 47 codes, 'smart transportation,' with 61 codes, 'human, social, and cultural infrastructures,' with 269 codes, 'smart economy,' with 48 codes, and 'smart environment' with 82 codes. The research results showed that although information and communications technology is considered an empowering context for Iranian smart cities, it is not necessarily the most vital factor. The implementation of "hard" infrastructures in Iranian smart cities is not enough, as the "soft" aspect of smart cities creates a real difference. The soft aspect comprises innovation in governance techniques, policy-making, as well as cultural and social topics.

DOI: [10.22034/ijumes.2024.2032850.1225](https://doi.org/10.22034/ijumes.2024.2032850.1225)

Running Title: *The contexts for realizing Iranian smart city; a study based on meta-synthesis*



NUMBER OF REFERENCES

35



NUMBER OF FIGURES

06



NUMBER OF TABLES

02

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INTRODUCTION

Over recent years, the rapid urbanization rise and technological development have accelerated the process of converting cities to smarter and more sustainable routes in response to climate changes and environmental challenges (Bidari et al., 2024). Almost 55% of the world's population lives in urban lands while urban land occupies only 1% of the whole world (Roy, 2020). According to the prediction of the United Nations (UN) development program, cities will accommodate two-thirds of the world's population by 2030, which means that in the future cities will be increasingly overpopulated and urban issues will be intensified. Smart cities provide practical solutions for many urban issues, such as environmental pollution, resource shortage, traffic congestion, and public security (Yan et al., 2020). Nowadays, the smart city phenomenon has become a vital approach for modern city development towards sustainable growth (van den Buuse et al., 2021). The smart city promises some advantages, such as a high quality of life, economic boom, and environmental sustainability through state-of-the-art technologies (Mosannenzadeh & Vettorato, 2014; Neirotti et al., 2014). The results of studies confirmed a direct relationship between smart city development and higher (relative) performance in all sustainability dimensions (Lim et al., 2024). Also, the construction of smart cities can directly and indirectly enhance the green space regarding land resource allocation (Wang, 2023). This concept tries to improve the quality of people's lives while achieving sustainable development by using Information and communications technology (ICT) (Tan & Taeihagh, 2020).

The smart city has become a common movement that has been supported by technology stakeholders since the 1990s (Myeong et al., 2018). However, it has gradually revealed that over-concentration on technology establishment results in the imbalance of the urban ecosystem that subsequently causes negation of social, human, and environmental capital

aspects, leaving negative social effects, including moral dilemmas, higher inequality, social isolation, and job loss (Gupta et al., 2019; Roy, 2020). Therefore, the expansion of the smart city notion evolved toward more understanding of human value. Smart cities mainly emphasize ICT but citizens' participation, cooperation, and cooperative governance are considered the most important factors for the successful development of smart cities (Yigitcanlar et al., 2018; Rochdane & Assaber, 2022). In other words, a wide and deep interaction with society is required for the successful design and implementation of smart city projects (Spicer et al., 2023). On the other hand, multifaceted and transparent governance mechanisms and regulatory frameworks are vital for supporting smart and sustainable cities (Sharifi et al., 2024). Moreover, innovation, business skills, ICT infrastructure, and government effectiveness are some of the key drivers in a smart city (Vanli & Akan, 2023). Research indicates that enhancing the efficiency of smart cities is closely linked to regional economic progress (Mao et al., 2023).

In general, there are two domains considered in smart cities, "hard" and "soft" domains. The hard domain describes urban technical systems and infrastructures, such as buildings, energy networks, transformation, and water management which have been enhanced through the application and interference of ICT strategies. On the contrary, the soft domain addresses the cultural and social aspects of the smart city, including education, governance, and social participation that aim to create suitable social and institutional conditions for ICT promotion (Albino et al., 2015; Neirotti et al., 2014; Schüle et al., 2021; Sharifi, 2019). Many researchers agree on six dimensions of a smart city which include economy, environment, government, life, mobility, and people (Camero and Alba, 2019; Caragli et al., 2011; Fernandez-Anez, 20). These dimensions were identified by the TU Wien Science Center (Giffinger et al., 2007), and have since been widely used by other researchers and

the EU. According to the existing theoretical literature, a smart city can be defined as a city that uses various ICT technologies, including digital devices, sensors, and IoT to promote the city in the digital world, ensure its cyber security, and improve six dimensions of economy, mobility, environment, people, life, and governance (Lai & Cole, 2023). Despite the advantages of a smart city, there are always some obstacles against the development of these advantages, necessitating the implementation of strategies to overcome these challenges. Some barriers found in this process are poor private-public participation, use of fossil fuels, inattention to the environment, insufficient infrastructure of internet technology, and use of old technologies in cities (Razmjoo et al., 2021).

Theories and strategies have been implemented in many major cities of developed countries, but there are still major energy consumption and other critical issues in developing countries due to strategies, technological systems background and infrastructures on their way toward an industrialized country. Thus, it is quite tangible that developing countries and their cities have to come up with strategies to improve their overall sustainability (Moulaii et al, 2020). The concept of smart city has also been introduced in Iran over recent years, and Urmia, Isfahan, Tehran, Mashhad, and Tabriz have been known as smart cities in Iran. Nevertheless, these cities are unable to fulfill all smart city indexes, so appropriate infrastructures must be created and relevant discussions and ideas need to be shared (Hashemi et al., 2020) The achievement of smart cities is a crucial goal for governments and urban development organizations, with cities worldwide striving to become

smart. Although many plans and projects have been provided to make metropolises smart in Iran, no effective steps have been taken to implement the development model of smart cities and their capacities (Tavanaee Marvi et al., 2022). Though there is a global consensus on the dimensions of smart cities, the realization of smart cities in various communities depends on their social-cultural characteristics, political-economic structures, and so forth. The challenge of contextualism in smart cities indeed requires further examination of this topic (Shokri Yazdanabad et al., 2021). Therefore, identifying the contexts and fields necessary for the realization of an Iranian smart city is essential for taking the first step towards this goal. Accordingly, this study aims to investigate and analyze the contexts for the realization of an Iranian smart city. The results of this study can be used as theoretical support and a foundation for selecting associated organizations to optimize smart city planning and formulate development strategies for Iranian smart cities based on the academic approaches.

MATERIALS AND METHODS

This study employs the meta-synthesis method to address the research questions. Meta-synthesis is a key technique within meta-study. Meta-study comprises four primary categories: meta-analysis (quantitative analysis of researched material), meta-synthesis (qualitative analysis of original content), metatheory (examination of theories in original studies), and metamethod (methodological analysis of original studies). Fig 1 illustrates these four categories (Bench and Day, 2010).

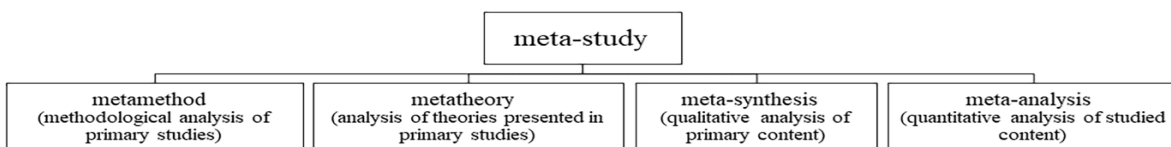


Fig 1: Different types of meta-study (adopted from Bench & Day, 2010)

Meta-synthesis investigates the ideas, mentalities, approaches, results, and findings of previous studies (Patterson, Thorne, Gillings, 2001), and has three major objectives: theory generation, theory description, and conceptual development (Zimer, 2004). Meta-synthesis is a process with separate steps enabling the researcher to find a certain research question, and then search, choose, evaluate, summarize, and combine evidence to answer the research question. In the opinion of Ervine, various authors have described different ways of this process but they are similar (Quoted by Abedi Jafari & Amiri, 2019). The number of steps mentioned for this method is one of the differences. This study has used a seven-step model by Sandelowski and Barros to achieve the main goal of the study. The mentioned model consists of the following steps: setting the research question, a systematic review of texts, searching and selecting the proper resources, data extraction, appraisal and synthesis of qualitative findings, controlling the quality of findings, and presenting the results (Khan Ahmadloo et al., 2017). Fig 2 shows the research process based on the mentioned model.

According to this process, the first step of the meta-synthesis technique is setting the research question. This study explores the contexts for implementing a smart city in Iran. The available literature is systematically reviewed to address

the research questions, followed by a search and study of academic papers using selected keywords. The target population for this study includes all Persian and English language papers that discuss the features, characteristics, and contexts of smart cities in Iran.

The Magiran, Sid, Noor Mags, Google Scholar, Taylor Francis, and Science Direct databases have been used to find the mentioned papers. Searching for and selecting the relevant references is done in the third step in which, the retrieved references must be reviewed and screened to achieve the best results and find the most proper references for data extraction. In total, 216 papers were collected in this study, which were reviewed through the critical appraisal skills program (CASP) technique to achieve more precise results. The CASP is a tool usually used for evaluating the quality of primary studies in qualitative research. According to the CASP index, research objectives, research logic, research plan, sampling, data collection, reflexivity, moral consideration, accuracy in analysis, expression of findings, and research value are examined (Khan Ahmadloo et al.). After the papers were screened through the CASP tool in this study, the final number of papers reached 55 and all of them were reviewed. Fig 3 indicates the process of paper search and selection in this study.

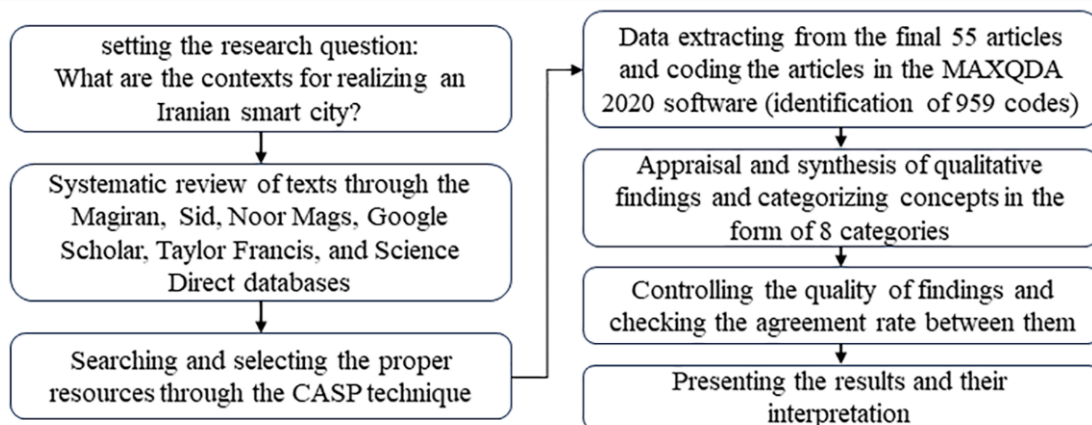


Fig 2: Extant research process

Among the 55 final papers that explored different aspects of smart cities in various cities of Iran, Tehran and Tabriz (8 papers) along with Ahwaz (5 papers) had the highest frequencies.

Fig 4 illustrates the cities and their frequencies analyzed in the final papers.

Table 1 presents the specifications of the final papers used in this study.

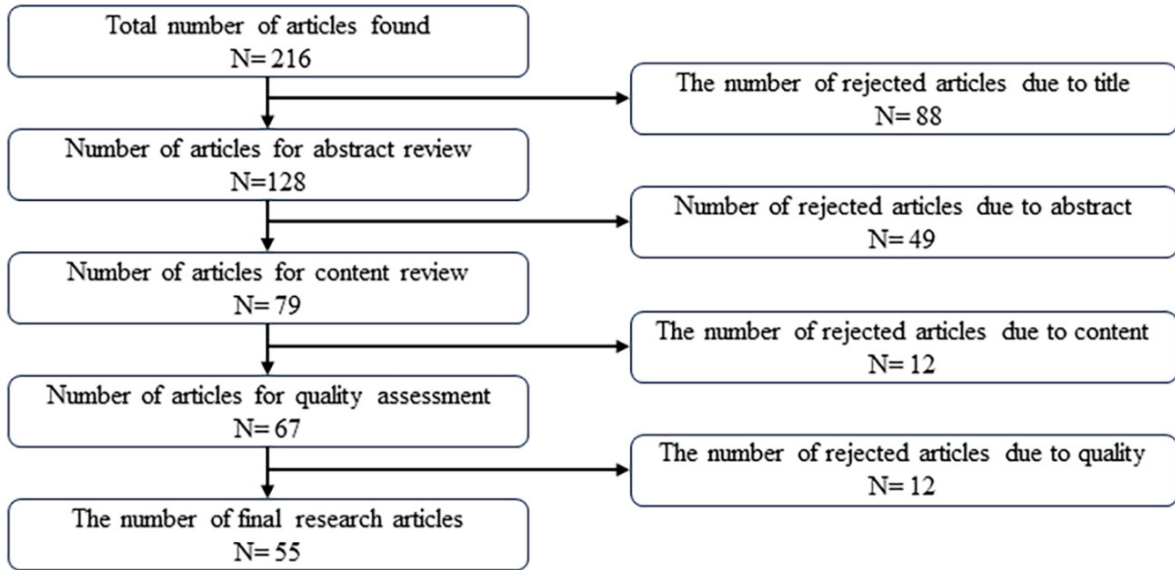


Fig 3: Process and searching and selecting papers in this study

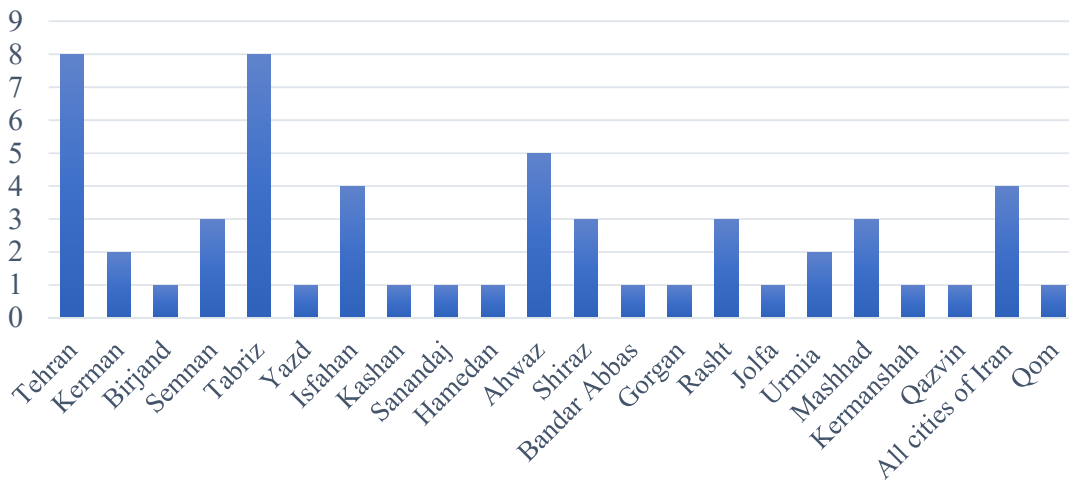


Fig 4: Cities examined in the final papers and their frequencies

Table 1: Specifications of final papers used in this study

Row	The author/authors	year of publication	The title of the journal	The city under study
1	Kiani, Akbar.	2011	Environmental based territorial planning (Amayesh)	All cities of Iran
2	Ajza Shokouhi, M., Naghibi Rokni, S. N., Alizadeh, H., Ahmadi, A.	2016	Int. J. Architect. Eng. Urban Plan	Ahwaz
3	Kamandari, Mohsen & Rahnama, Mohammad Rahim.	2017	Geographical space	Kerman
4	Eskandarisani, Mohammad., Moradi, Mahmood., Parvin Ghaderimoghadam.	2018	Geographical Research on Desert Areas	Birjand
5	Pourahmad, Ahmad., Ziari, Keramatollah., Hataminejad, Hossein., Parsa., Shahram.	2018	New attitudes in human geography	Tehran
6	Romina, Ebrahim., Mahdavi, Masoud., Ziari, Yousef Ali., Khodadadi, Raheleh.	2018	Environmental based territorial planning (Amayesh)	Semnan
7	Rostaei, Shahrivar., Pourmohammadi, Mohammadreza., Ghanbari, Hakimeh.	2018	Geography and territorial spatial arrangement	Tabriz
8	Fallah Tafti, Hamed., Heydari Kooshaknoo, Majid., Almasi Sarvestani, Raziye.	2019	Journal of urban economics and management	Yazd
9	AfzaliNaniz, M., Modiri, M., Farhudi, R.	2019	Journal of Urban Social Geography	Kerman
10	Nastaran, Mahin., Pirani, Farzane.	2019	Journal of geography and urban space development	Isfahan
11	Nohegar, Ahmad., Alavi Naeini, Ali., Amiri, Mohammad Javad., Salahshour, Mehdi.	2019	The Journal of Geography (Regional Planning)	Tehran
12	Ebrahimi, Mahdi., Pakar, Maryam., Samaninejad, javad.	2020	Urban Management Studies	Kashan
13	Aminnejhad, kaveh., Gafari, Ata., Yazdani, Mohammad Hassan., Mohammadi, Alireza.	2020	Journal of Studies of Human Settlements Planning	Sanandaj
14	Noori, Negar., de Jong, Martin., and Hoppe, Thomas.	2020	smart cities	All cities of Iran
15	Jabarzadeh, Yunus., Shukri, Surah., Karami, Adjdar.	2020	Journal of Urban Economics and Management	Tabriz
16	Jafarnejad, Mahdiyeh., Sadeghi Naeini, Hassan.	2020	Urban and Regional Development Planning	Iran's metropolises
17	Rabani Arshad, Hamid; Asghari Sarem, Ali; Slambolchi, Alireza; Saeedi, Mehdi.	2020	Journal of Public Administration	Hamedan
18	Rahnama, Mohammad Rahim., Hosseini, Seyed Mostafa., Mohammadi Hamidi, Somayeh.	2020	Human Geography Research	Ahwaz
19	Kavoosi, Elahe., Mohammadi, Jamal.	2020	Geography	Shiraz
20	Baradaran Khanian, Zeinab., Panahi, Hossein., Asgharpour, Hossein Saeed.	2021	Urban Economics	Tabriz
21	Alizadeh Bazrafshan, Navidreza., Kharazmi, Omid Ali.	2021	Wiley	Mashhad
22	Baluchi, Asma., Behboudi, Mohammad Reza., Torabi, Mohsen.	2021	Journal of Iranian Public Administration Studies	Bandar Abbas

Row	The author/authors	year of publication	The title of the journal	The city under study
23	Shami, Mohammad Reza., Bigdelirad, Vahid., Moenifar, Maryam.	2021	Geography (Regional Planning)	Tehran
24	Sargolzaei, Sharifah., Mohamadi, Mahmood., Mokhtari Malek Abadi, Reza., Shiran, Gholam. Reza.	2021	Motaleate Shahri	Isfahan
25	Firoozi, M. A., Pourahmad, A., Sajadian, M.	2021	Journal of Urban Social Geography	Ahwaz
26	Kavoosi, Elahe., Mohammadi, Jamal.	2021	Journal of geographical sciences,	Shiraz
27	Fadayi, Alireza., Gorji, Mohammad Bagher., Samiee, Rouh Allah.	2021	Studies in Entrepreneurship and Sustainable Agricultural Development	Gorgan
28	Mehdizadeh, Zahra., Jodaki, Hamidreza., Ziyari, Yusuf Ali.	2021	Geography (Regional Planning)	Tehran
29	Sajadian, Mahyar., Firoozi, Mohamad Ali., Pourahmad Ahmad.	2022	Journal Strategic Studies of Public Policy	Ahwaz
30	Shariatpour, Farshad., Behzadfar, Mostafa.	2022	Soffeh	Tehran
31	Ebadinejad, Maryam., Taheridemneh, Mohsen., Zakeri, Ali	2022	Journal of future cities vision	Isfahan
32	Fallahi, Azadeh., Faraji, Amin., Gharibi, Amin.	2022	Journal of Business Intelligence Management Studies	All cities of Iran
33	Monadi, Aref., Behzadfar, Mostafa.	2022	Journal of Productivity Management	Tabriz
34	Beheshti Shirazi, S. S., Jaliliasadabad, S., & Parhizgar, Sh.	2022	Journal of Geographical Urban Planning Research	Tehran
35	Zeynaly Azim, Ali.	2022	Political Spatial Planning	Tabriz
36	Ziari, K., Hataminejad, H., Pourahmad, A., Zanganeh, S., Hamghadam, N.	2022	Naqshejahan	Rasht
37	Ziyari, Keramatollah., Ehsanifard, Ali Asghar.	2022	Journal of Physical Development Planning	Semnan
38	Zeynali Azim, A.	2022	Geography and Environmental Sustainability	Jolfa
39	Shokri Ghaffarbi, Elham., Soleimani, Alireza & Ezatpanah, Bakhtiar.	2022	Journal of Studies of Human Settlements Planning	Urmia
40	Tavanaei Marvi1, Laleh., Behzadfar, Mostafa., Mofidi Shemirani, Seyed Majid	2022	Journal of Sustainable City	Mashhad
41	Ali Abbas Shahir, Nasim., Hosainzadeh Dalir, Karim., Nazmfar, Hossein.	2022	Journal Research and Urban Planning	Tabriz
42	Mohammadi Shafi, Saeed., Armaqan, Simin., Azad Bakht, Bahram.	2022	Journal of Urban Peripheral Development	Qom
43	Hamghadam, N., Ziari, K., Hataminejad, H., Pourahmad, A., Zanganeh, S.,	2022	Journal of future cities vision	Rasht
44	Shokri Ghaffarbi, Elham., Soleimani, Alireza & Ezatpanah, Bakhtiar.	2022	Geography and Development	Urmia

Row	The author/authors	year of publication	The title of the journal	The city under study
45	Ehsanifard, Ali Asghar., Ziyari, Keramatollah.	2023	Journal of future cities vision	Semnan
46	Daneshvar, Fatemeh., Khademolhoseiny, Ahmad., Gandomkar, Amir., Nadimi-Shahraki, Mohammad H.	2023	Journal of Geography and Urban Space Development	Isfahan
47	Sajadian, M; Firoozi, M A; & Pourahmad, A.	2023	Geography and Development	Ahwaz
48	Wynn, Martin., Hosseini, Seyedeh Zahra., Parpanchi, Seyed Mostafa.	2023	Journal of Infrastructure, Policy and Development	Tehran
49	SalehiPanahi, MirMohammad., Darskhan, Rasool., Singery, Maryam., Famarzi, Mahsa.	2023	Passive Defense	Tabriz
50	Elah Karmi, A., Kamyabi, S., Zand Moghadam, M. R.	2023	Journal of Sustainable City	Tehran
51	Baradaran Khanian, Zeinab., Panahi, Hossein., Asgharpur, Hossein.	2023	Quarterly Journal of Applied Theories of Economics	Tabriz
52	Anabestani A. Kalantari M. Niknami N.	2023	Urban Economics and Planning	Mashhad
53	Faraji Darabkhani, Mohammad., Afradi, Abbas., Samaninejad, Mohammad Javad., Shahinifar, Hamidreza.	2023	Journal of future cities vision	Kermanshah
54	Ghasemi, Hakem., Keshavarz Turk, Einollah., Mortazavi, Seyed Morteza., Hadizadeh, Morteza.	2023	Journal of future cities vision	Qazvin
55	Hamghadam, N., Ziari, K., Hataminejad, H., Pourahmad, A., Zanganeh, S.,	2023	Geographical Studies of Coastal Areas Journal	Rasht

The next steps of the meta-synthesis technique include extracting data from selected papers, analysis, and synthesis of qualitative findings. For this purpose, the final references were coded through MAXQDA 2020 Software based on the research question to examine the contexts for realizing an Iranian smart city. According to the results, 959 codes were identified through the data extraction process and were classified based on similar concepts into 8 categories: “Developing a native model of smart city” with 38 codes, “ICT infrastructures” with 113 codes, “managerial-institutional infrastructures” with 38 codes, “capacity building in knowledge-based and innovative sectors” with 47 codes, “smart transportation” with 61 codes, “human, social and cultural infrastructures” with 269 codes, “smart economy” with 48 codes, and “smart environment” with 82 codes. Fig 5 shows the relative abundance of categories

and, Fig 6 shows the agreement rate between different codes among the documents reviewed through MAXQDA 2020 Software. The final step presents findings that are described in the next section of the study.

DISCUSSION AND FINDINGS

As previously stated, the concepts extracted from papers were categorized into 8 main groups in this study. The categories are described in detail herein.

A: Developing a native model of a smart city

38 codes have been assigned to the category of developing a native model of the smart city. There are some unique structures and circumstances in each country that are different from other countries, and the same applies to Iran. Therefore, it is necessary to illustrate and develop a model at the national level as a roadmap for city smartening. In other words, not only

should global attention be paid to the smart city, but also the national and local context and fabric must be considered. The research findings offer that the development of a native model for city smartening based on an Iranian-Islamic approach and indicators of an indigenous resistive economy helps to clarify the trajectory for the realization of an Iranian smart city. According to the results, this model can be integrated with the budgeting and funding model of a smart

city and implemented as a trial in one of several districts or cities.

B: Managerial-institutional infrastructures

This category was extracted through analysis and synthesis of findings, concepts of appropriate structures and rules, technical power, manpower, and institutes. This category is described in this paragraph. According to the results, appropriate institutional-managerial in-

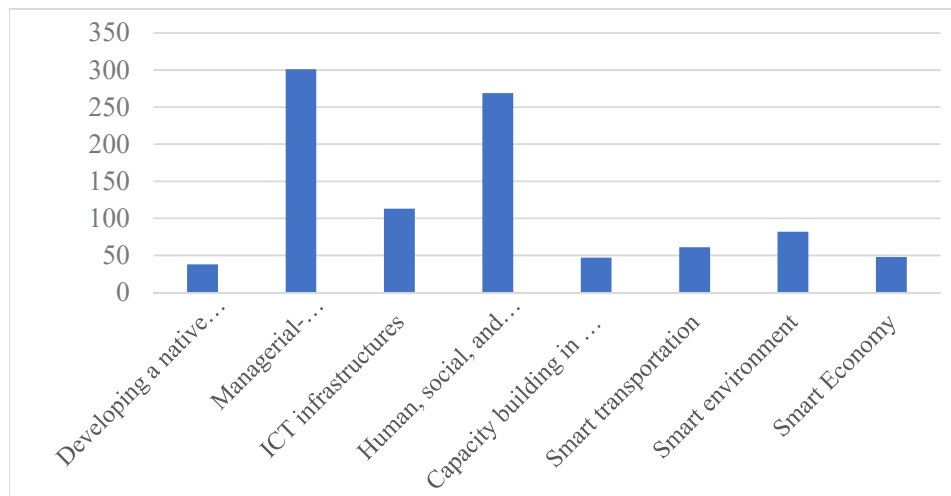
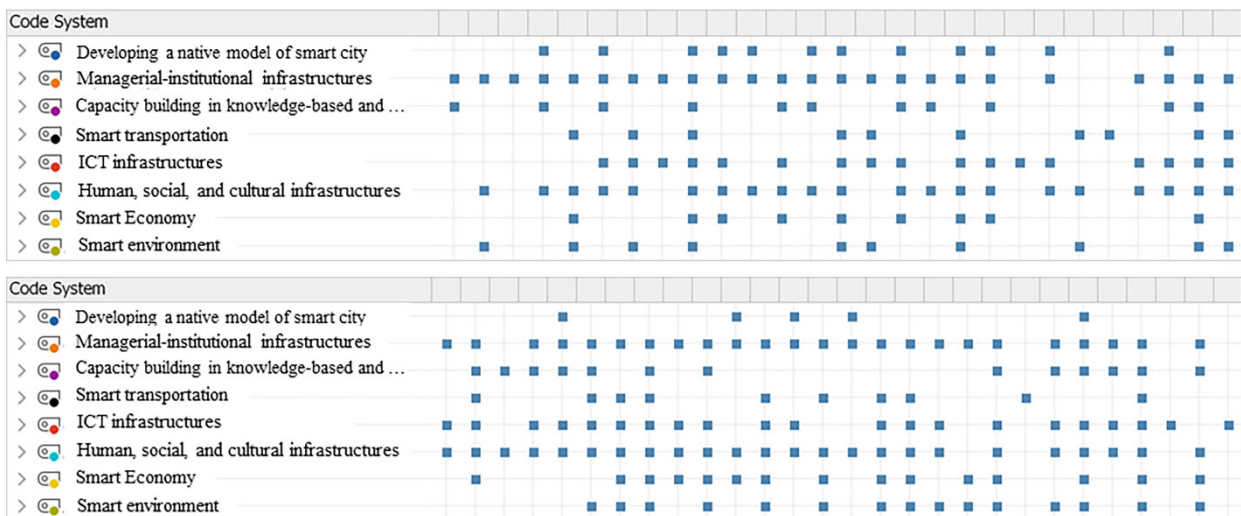


Fig 5: Relative abundance of categories



Figs 6: Agreement rate between different codes among papers reviewed through MAXWDA Software

frastructures are among the substantial contexts required for realizing an Iranian smart city. This category has assigned the maximum number of extracted codes with a significant gap (301 codes), which implies the importance of this category and the researchers' emphasis on it. Therefore, it is essential to establish appropriate structures and regulations, including relevant policies and legal frameworks, to support the transition from the current centralized urban management model to modern, entrepreneurial, innovative, sustainable, flexible, transparent, fair, participatory, effective, and efficient urban management practices. On the other hand, the role of institutes and their interactions cannot be ignored. According to the research findings, various national and international organizations, including public, private, social, cultural, and such institutes must cooperate to create a smart city. A systematic and holistic view, the interaction between institutes, integrated urban management, and integrated measures taken at different levels are needed to create an Iranian smart city.

Sufficient technical power is another crucial concept within the realm of managerial-institutional infrastructures. The results show that this important factor is achieved through improving ICT infrastructures, increasing the electronic capacity of institutions, enhancing the number and quality of e-services, and developing online services. Furthermore, the personnel or workforce in the organization related to urban management plays an effective role in realizing a smart city. Development and employment of professional, creative, dedicated, and motivated staff, improvement of understanding and knowledge of managers and staff, and keeping the ethical standards of accountability, responsibility, and legality are among vital factors that are emphasized in the process of achieving a smart city in Iran. On the other hand, city smartening cannot be realized completely until the managers and officials are willing to provide services and underpin the smartening projects.

C: ICT infrastructures

ICT is the key factor for developing Iranian smart cities, so ICT development has been considered in some studies as a starting point for thinking about other topics in this field. In this research, 113 codes have been assigned to the ICT category. Key concepts in this field include the advancement of technology infrastructures and ensuring universal access for all citizens to both software and hardware components of ICT, such as computer availability and optimal internet connectivity. The Internet of Things (IoT) that is integrated with urban infrastructures and services is also assigned to this category. On the other hand, the participation of the private sector in investment in smartening projects, and encouraging or attracting investors by granting reasonable loans are considered as other requirements for realizing Iranian smart cities that are assigned to the ICT category.

D: Human, social, and cultural infrastructures

The presence of appropriate human, social, and cultural infrastructures is one of the most substantial contexts for realizing an Iranian smart city. The significant frequency of codes (269 codes) assigned to this category reveals the case. According to the findings, some mechanisms must be available for the co-creation and participation of citizens in developing smart cities. The public participation rate in urban development projects is undoubtedly a piece that completes the puzzle of smartening Iran's cities. Also, culture building, training, and informing different segments of society in the fields related to the nature and methods of smartening, as well as empowering citizens and encouraging them to use smart city services are among other requirements for the realization of smart cities in Iran. Moreover, the Iranian smart city requires resourceful, intelligent, creative, lawful, and adaptable citizens with open and cosmopolitan mindsets, as well as trust-based relationships, social cohesion, and unity. Furthermore, ensuring and enhancing levels of safety, both objective and subjective, is another crucial consideration.

E: Capacity building in knowledge-based and innovative sectors

The results of the study confirm the effectiveness of knowledge-based development and support for modern technologies in realizing smart cities in Iran. In the research process, 47 codes were assigned to this category. Knowledge generation institutions, including universities, science and technology parks, knowledge-based companies, innovation centers, and start-ups must receive greater attention from decision-makers who make policies for realizing Iranian smart cities. Innovation is highly important in the process of creating smart cities in Iran, so some urban planners suggest that the innovation rate of a city is the final factor that distinguishes cities.

F: Smart transportation

Urban transportation is an important factor plays a crucial role in the development of smart cities. The number of codes assigned to this category equaled 61. Smart transportation seems to be more objective than other categories associated with the smart city. The findings introduce the most effective factors in this case: increasing local access, creating and promoting sustainable, flexible, and multimode transportation systems with an emphasis on public transportation, pedestrians, and cycling, and developing subway lines, hybrid cars, and automobiles with zero pollution. Other strategies that contribute to smart transportation include the use of high-tech systems for smart traffic control, the creation of integrated transportation platforms, the development of smart parking management services, the optimization of traffic lights, the installation of smart sensors in cities, and the creation of charge stations for hybrid cars.

G: Smart environment

A smart environment is another context required for realizing an Iranian smart city. In general, this category points to sustainable resource management, environmental protection, environmental pollution decline, and environmental conditions adjustment. In this study,

82 codes have been assigned to this category that can be realized through various strategies. Cultural creation and development of urban ecosystems are some of these strategies. On the other hand, modern technologies and smart systems must be used in the energy management of buildings, smart waste management systems, and smart irrigation systems to achieve a smart environment.

H: Smart Economy

48 codes are assigned to the smart economy category. The results show that the required fields for a smart economy must be provided to realize the Iranian smart city. In this context, the way must be paved to reach a sustainable, competitive, efficient, innovative, and entrepreneurial economy. Moreover, it is necessary to formulate a comprehensive business framework in the smart city, develop smart local businesses, and provide the field for a start-up economy. On the other hand, another important aspect in this category is planning to achieve national and international rank for the city.

Table 2 reports the contexts for realizing an Iranian smart city based on the findings of this study.

RESULT AND CONCLUSION

The realization of smart cities in various communities highly depends on their social-cultural characteristics, as well as political, economic, and other structures. Therefore, it seems to find the required contexts to realize what the Iranian smart city achieves at the first step. The contexts for the realization of the Iranian smart city are examined and analyzed by using the meta-synthesis method in this research. According to the results of the study, managerial-institutional infrastructures are highly important for realizing an Iranian smart city. In this regard, setting up appropriate structures and laws such as proper policy and legal infrastructure, fundamental changes in urban management, and moving from the current centralized structure towards new methods of urban management with entre-

Table 2: Contexts for realizing Iranian smart city

Categories	Concepts	Number of initial codes
Developing a native model of smart city	Developing a clear outlook with an Iranian-Islamic approach, Developing native funding for smart cities, Developing a leadership model for smart city	38 initial codes
Managerial-institutional infra-structures	Proper structures and rules, manpower, sufficient technical power, having a systematic and holistic view of associated institutions	301 initial codes
ICT infrastructures	Developing technology infrastructures, citizen's desired and fair access to both software and hardware domains of ICT, participation of private sector and investors	113 initial codes
Human, social, and cultural infrastructures	Cocreation and participation of citizens in the development of smart cities, culture creation, training and sharing information, safety, objective-subjective security, personal and social characteristics	269 initial codes
capacity building in knowledge-based and innovative sectors	Paying attention to knowledge generation organizations, knowledge-based development, supporting modern technologies	47 initial codes
Smart Transportation	Creating transportation service platforms, public participation in smart transportation, flexible and multimode transportation system	61 initial codes
Smart environment	Smart housing and buildings, smart energy source management, environment protection, environmental pollution decline, and development of urban ecosystem	82 initial codes
Smart Economy	Sustainable, efficient, novel, and entrepreneurial economy, formulating a holistic business framework in the smart city, developing start-up and smart business, defining national and international rank of city	48 initial codes

preneurial, innovative, Stable, flexible, open, and transparent data, fair, participation-oriented, effective and efficient, it seems necessary.

Also, the development and employment of specialized, creative, committed, and motivated human resources, improving the understanding and awareness of managers and employees, and maintaining the spirit of accountability, responsibility, and desirable legality are among the things that are emphasized to achieve a smart city in Iran. Sufficient technical capacity and the existence of a systemic and holistic view, the interaction between institutions the existence of integrated urban management, and the implementation of integrated measures at different levels should also be considered.

On the other hand, the existence of appropriate human, social, and cultural infrastructures is considered as one of the most important fields for realizing the Iranian smart city. Co-creation and participation of citizens are essential in the development of smart cities. Also, culture building and education and informing different strata of people in the fields related to the nature and methods of smartening and empowering citizens as well as encouraging them to use smart city services are considered as other requirements for the realization of smart cities in Iran. becomes providing and improving the level of objective and subjective safety and security is another important issue that should be considered in this field.

Based on the findings, although ICT can be taken into account as an empowering field for Iranian smart cities, it is not necessarily the most vital factor. The research results show that the implementation of “hardware” infrastructures in the Iranian smart city is not enough to create a difference, but it is the “soft” domain of the smart city that provides innovation in governance and policymaking methods, as well as the social and cultural contexts. Developing a native model for a smart city, building capacity in knowledge-based and innovative sectors, smart transportation, smart environment, and smart economy are among other contexts required for realizing the Iranian smart city. It is recommended to prepare and develop practical strategies based on the contexts presented in this research with emphasis on the managerial-institutional infrastructures, and human, social, and cultural infrastructures separately to realize an Iranian smart city. It is also recommended to examine the development of the Iranian smart city model in further studies regarding the managerial features and structures, and social and cultural characteristics of Iran. Ultimately, the findings of this study appear to offer a valuable theoretical foundation and framework for decision-making in relevant organizations to enhance smart city planning and implement Iranian smart city development strategies academically.

REFERENCES

- Abedijafari, A., & Amiri, M. (2019). *Meta-Synthesis as a Method for Synthesizing Qualitative Researches. Methodology of Social Sciences and Humanities, 25(99), 73-87. (in Persian) doi: 10.30471/mssh.2019.1629*
- Albino, V., Berardi, U., & Dangelico, R. (2015). *Smart cities: Definitions, dimensions, performance, and initiatives. Journal of Urban Technology, 22 (1), 3-21. 10.1080/10630732.2014.942092.*
- Bench, S., & Day, T. (2010). *The user experience of qualitative research. International journal of nursing studies, 47 (4), 487-499.*
- Bibri, S.E., Huang, J., Jagatheesaperumal, S.K., Krogstie, J. (2024). *The synergistic interplay of artificial intelligence and digital twin in environmentally planning sustainable smart cities: A comprehensive systematic review, Environmental Science and Ecotechnology, 20. https://doi.org/10.1016/j.ese.2024.100433*
- Camero, A., & Alba, E. (2019). *Smart City and information technology: A review. Cities (London, England), 93, 84-94. 10.1016/j.cities.2019.04.014.*
- Caragliu, A., Del Bo, C., & Nijkamp, P. (2011). *Smart Cities in Europe. Journal of Urban Technology, 18 (2), 65-82. 10.1080/10630732.2011.601117.*
- Fernandez-Anez, V. (2016). *Stakeholders approach to smart cities: A survey on smart city definitions. Smart Cities, 157-167. 10.1007/978-3-319-39595-1_16.*
- Giffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovi ć, N., & Meijers, E. (2007). *Smart cities: Ranking of European medium-sized cities. Centre of Regional Science (srf). Vienna University of Technology.*
- Gupta, P., Chauhan, S., & Jaiswal, M. (2019). *Classification of smart city research-a descriptive literature review and future research agenda. Information Systems Frontiers, 21(3), 661-685.*
- Hamzehkolaei, A. G., Behifar, M., & Azadi Ahmadabadi, G. (2021). *Sustainable Smart Cities: Based on Fuzzy DEMATEL Approach. International Journal of Urban Management and Energy Sustainability, 2(3), 59-66. doi: 10.22034/jumes.2021.249029*
- Hashemi, S. A., Rahnejat, M., Sharifzadeh, F., & Saadi, M. R. (2020). *Relationship between Good Governance and a Smart City: A case study of Tehran. Socio-Cultural Strategy, 9(1), 67-90. (in Persian) 20.1001.1.22517081.1399.9.1.3.6*
- Khan Ahmadloo, Samane, Feyzi, Mohsen, & Mofidi Shemirani, Seyed Majid. (2017). *The effect of the thermal behavior of the building shell in the modified construction of residential buildings to reduce energy waste. Urban management, 16(47), 433-446. (in Persian) SID. https://sid.ir/paper/92356/en*

- Lai, C.M.T., Cole, A. (2023). Measuring progress of smart cities: Indexing the smart city indices, *Urban Governance*, 3, 45-57. <https://doi.org/10.1016/j.ugi.2022.11.004>
- 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, 47-55. <https://doi.org/10.1016/j.ugi.2023.11.003>
- Mao, C., Wang, Z., Yue, A., Liu, H., Peng, W. (2023). Evaluation of smart city construction efficiency based on multivariate data fusion: A perspective from China, *Ecological Indicators*, 154. <https://doi.org/10.1016/j.ecolind.2023.110882>
- Mosannenzadeh, F., & Vettorato, D. (2014). Defining smart city. A conceptual framework based on keyword analysis. *Tema. Journal of Land Use, Mobility and Environment*.
- Moulaii, M., Kharvari, F., Shahhosseini, G., & Esmailpour Zanjani, N. (2020). Definition and recognition of required factors for smartening cities in developing countries. *International Journal of Urban Management and Energy Sustainability*, 1(2), 15-23. doi: 10.22034/IJUMES.2019.06.15.012
- Myeong, S., Jung, Y., & Lee, E. (2018). A study on determinant factors in smart city development: An analytic hierarchy process analysis. *Sustainability*, 10(8), 2606.
- Neirotti, P., De Marco, A., Cagliano, A. C., et al., (2014). Current trends in smart city initiatives: Some stylised facts. *Cities*, 38, 25–36 Elsevier.
- Paterson, B., Thorne, C. C., & Jillings, C. (2001). *Meta-study of qualitative health research: a practical guide to meta-analysis and meta-synthesis*. California, Sage.
- Razmjoo, A., Østergaard, P.A., Denai, M., Majidi Nezhad, M. (2021). Effective policies to overcome barriers in the development of smart cities, *Energy Research & Social Science*, 79. <https://doi.org/10.1016/j.erss.2021.102175>
- Rochdane, H., Assaber, O. (2022). Informal collaboration: building a smart city through self-organized stakeholders, *Smart Cities and Regional Development Journal*, 6 (1). <https://www.ceeol.com/search/article-detail?id=1025509>
- Roy, A. (2020). *How today's biggest trends will collide and reshape the future of everything: Mauro F. Guill'en*. New York: St. Martin's Press, 278 pp.
- Sharifi, A. (2019). A critical review of selected smart city assessment tools and indicator sets. *Journal of Cleaner Production*, 233, 1269–1283. 10.1016/j.jclepro.2019.06.172.
- Sharifi, A., Allam, Z., Bibri, S.E., Khavarian-Garmsir, A.R. (2024). Smart cities and sustainable development goals (SDGs): A systematic literature review of co-benefits and trade-offs, *Cities* 146. <https://doi.org/10.1016/j.cities.2023.104659>
- Shokri yazdan abad, S., Pourjafar, M., Rafieian, M. (2022). Investigating the Compatibility of Smart Cities with Their Context, 6 (19), 1-32. (in Persian) doi: 10.22054/urdp.2022.65097.1399
- Spicer, Z., Goodman, N., Wolfe, D.A. (2023). How 'smart' are smart cities? Resident attitudes towards smart city design, *Cities*, 141. <https://doi.org/10.1016/j.cities.2023.104442>
- Tan, S., & Taeihagh, A. (2020). Smart City Governance in Developing Countries: A Systematic Literature Review. *Sustainability*, Vol.12, No.3, 1-29.
- Tavanaei Marvi, L., Behzadfar, M., Mofidi Shemirani, S.M. (2022). Analysis Smart City Implementation Challenges Case Study: Mashhad, *Journal of Sustainable City*, 5 (1), 45- 51. (in Persian) doi: 10.22034/jsc.2022.311642.1578
- Van den Buuse, D., van Winden, W., & Schrama, W. (2021). Balancing exploration and exploitation in sustainable urban innovation: An ambidexterity perspective toward smart cities. *J. Urban Technol.*, 28(1–2), 175–197.
- Vanli, T., Akan. T. (2023). Mapping synergies and trade-offs between smart city dimensions: A network analysis, *Cities*, 142. <https://doi.org/10.1016/j.cities.2023.104527>
- Wang, F. (2023). Does the construction of smart cities make cities green? Evidence from a quasi-natural experiment in China, *Cities*, 140. <https://doi.org/10.1016/j.cities.2023.104436>

Yan, J., Liu, J., Tseng, F.M. (2020). An evaluation system based on the self-organizing system framework of smart cities: A case study of smart transportation systems in China, *Technological Forecasting and Social Change*, 153. <https://doi.org/10.1016/j.techfore.2018.07.009>

Yigitcanlar, T., Kamruzzaman, M., Buys, L., et al., (2018). Understanding 'smart cities': In-tertwining development drivers with desired outcomes in a multidimensional frame-work. *Cities Elsevier*.

Zimmer, L. (2004). Qualitative meta-synthesis: a question of dialoguing with texts. *Journal of advanced nursing*, 53 (3), 311-318.

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HOW TO CITE THIS ARTICLE

Saffarsabzevar, F. (2024). The contexts for realizing Iranian smart city; a study based on meta-synthesis. *International Journal of Urban Management and Energy Sustainability*, (), -.
DIO: [10.22034/ijumes.2024.2032850.1225](https://doi.org/10.22034/ijumes.2024.2032850.1225)

