Causal Layered Analysis of the Current State of Inter-Organizational Knowledge Sharing in Tehran Smart City: The Study of Information and Knowledge Organizations

Somayeh Jafari Baghiabadi
PhD in Knowledge & Information Sciences; University of Tehran; Tehran, Iran Email: somayyeh.jafari@ut.ac.ir

Mohammad Reza Vasfi*
PhD in Culture and Civilization; Assistant Professor; University of Tehran; Tehran, Iran Email: mvasfi@ut.ac.ir

Shima Moradi
PhD in Knowledge & Information Sciences; St. Augustine University of Medical Sciences; California, US;
Email: smoradi@usa.edu

Alireza Noruzi
PhD in Information and Communication Sciences; Associate Professor; University of Tehran; Tehran, Iran Email: noruzi@ut.ac.ir

Iranian Journal of Information Processing and Management

Received: 22, Aug. 2023 | Accepted: 23, Oct. 2023 | The article has been with the authors for 20 days for Revision

Iranian Research Institute for Information Science and Technology (IranDoc)
ISSN 2251-8223
eISSN 2251-8231
Indexed by SCOPUS, ISC, & LISTA
Vol. 40 | No. 1 | pp. ??-??
Autumn 2024
https://doi.org/jipm.40.1

Abstract: The current research aims to analyze the causes affecting the formation of the current state of inter-organizational knowledge (assets) sharing in the information and knowledge organizations located in Tehran smart city. Methodology: In terms of the purpose, this research is applied research with a descriptive nature, which was conducted with a mixed-method approach. In the qualitative part, the causes affecting the current state of inter-organizational knowledge sharing of organizations in the field of information and knowledge, such as the National Library and Archives of I.R. Iran, the Iranian Research Institute for Information Science and Technology (IranDoc), the organizations in charge of the public libraries and the university libraries of the country in Tehran was gathered through a semi-structured interview with 14 managers of information and knowledge organizations; In the quantitative part, the identified causes were validated using a

* Corresponding Author

researcher-made questionnaire using the Delphi technique (in two rounds) and the consensus opinion of 22 experimental experts. Data analysis has been done in the qualitative part by layered causal analysis and in the quantitative part using descriptive statistics indicators and Excel and SPSS software. Findings: The analysis of the data from the interviews led to the formation of 104 causes in the form of 39 causes in the litany layer, 25 causes in the systemic layer, 20 causes in the discourse layer, and 19 causes in the metaphor layer; After the second round of Delphi, 90 causes were validated in the form of 31 causes in the litany layer, 25 causes in the systemic layer, 19 causes in the discourse layer and 8 causes in the metaphor layer. In total, the causes of "Bipolar or hierarchical knowledge", in the metaphor layer and "inability of organizations to resolve conflict of interests" and "lack of necessary infrastructure" in the systemic layer had the highest mean; The causes of "selection of senior managers of information and knowledge centers based on political orientation", "lack of attention to becoming knowledge-based" and "viewpoint and approach of the organization leader" in the discourse layer had the next mean; The causes of "lack of common/centralized data and knowledge base and platform" and "non-implementation of knowledge management and inter-organizational communication" in the litany layer were ranked third in terms of the mean. Conclusion: In order to solve the problems and challenges of the current state, it is necessary to design and implement scenarios with the priority of creating discourse and changing the metaphors of the actors in this field, focusing on solving the problems caused by the bipolar or hierarchical knowledge metaphor and the discourses of the leadership approach of organizations, the selection of managers, and the knowledge-based approach.

Keywords: Inter-organizational Knowledge Sharing, Inter-Organizational Information Sharing, Inter-Organizational Data Sharing, Smart life, Smart People, Libraries and Information Centers

1. Introduction

In a smart society, knowledge assets should be considered as common capital between experts and citizens in the framework of the goal of sustainable development (Laurini, 2021). On the other hand, the involvement of various government organizations in hosting the smart city, combined with the traditional administrative structure of the municipality, has increased the city's costs and established a foundation for the decisions and actions of the islands (Esfandiari

and Mousakhani, 2021). In this context, one of the primary challenges in establishing and developing smart cities is the distribution of various knowledge assets-such as data, information, and knowledge—across different sectors and regions. Additionally, the ownership of these assets and the purposes for which they are used raise significant ethical concerns that stakeholders in smart cities must address. Consequently, there is a pressing need for an effective management mechanism (Bianchini & Avila, 2014; Cobb, 2016; Kitchin, 2016).

In general, smart cities are the result of interactions between citizens, organizations, and urban functions using the adoption of different smart city technologies that can support the acquisition, sharing, and transfer of knowledge assets (Abdalla, Suresh, & Renukappa, 2020). In other words, all the organizations in the smart city, which are the source of providing services to citizens in specific areas, make their decisions based on a series of common data, information, and knowledge and at a common point (Sadeghi, 2013). All of these cases should lead to transforming the urban environment into a platform where the government, municipalities, citizens, and businesses can interact and collaborate. Such platforms should be open, with knowledge exchange as a fundamental component (Ferronato & Ruecker, 2018).

An overview of the services provided to citizens by municipalities and other government organizations shows that in the Islamic Republic of Iran, the process of providing services is designed independently from each other. These problems still exist in converting traditional processes to smart processes and each of the related organizations provides their services independently from the services of other organizations. The construction, management, and planning of smart cities necessitate the development of suitable platforms, infrastructures, and capabilities to share, process, and utilize data, information, and knowledge among various organizations (Jafari Baghiabadi & Jabbari, 2018). In other words, inter-organizational knowledge sharing is a crucial factor in the establishment and development of smart cities. By facilitating this sharing, redundancies in the production and collection of data and information have been minimized, ultimately enhancing the acquisition of knowledge across various organizations. Additionally, it has led to cost reductions and has enabled more effective transfer and sharing of knowledge assets, aligning with strategic planning and decision-making

processes.

From the perspective of knowledge management, the smart city represents a complex network of connections that is constantly moving and evolving under the influence of the combined flow of capital connected to the needs of an innovative society; It is completed by an appropriate, open, and transparent legal framework, supported by public and private partnership, and its development is accelerated by the expertise of human resources and the creativity factor of its society (Boyes, 2016). Also, knowledge management includes a series of processes and a wide range of tools, methods, and techniques that can be used to facilitate smart insight, generate ideas, and help approve them and strengthen citizens' participation in smart city decision-making.

Today, cultural-social activities in smart cities have a special place in different dimensions such as life and smart people, because the members of the society realize themselves through it, develop their talents, and expand their personality (Rashidi et al., 2014). One of the criteria of cultural development is access to information and knowledge by the people of the society and citizens (Sorkh Kamal, Biranvandzadeh, and Zanjrichi, 2012). In the Islamic Republic of Iran, there are many cultural-social organizations, such as "The National Library and Archives of I.R. Iran", "The Iranian Research Institute for Information Science and Technology (IranDoc)", the organizations in charge of the country's public libraries, and the central libraries of universities in Tehran; These organizations plan and implement actions and activities in line with the goals and strategies of their organization, directly or indirectly in the fields related to information and knowledge, however, there is no necessary coherence and communication between them, which affects their effectiveness, executive power (Bigdeli, 2015) and their smartening.

In general, the smart city is based on knowledge sharing and collaboration at all levels of society. Such a society is considered an open society in which a person or an organization can use different levels of knowledge assets, including types of data, information, or ideas of another person or organization, develop it, and finally, return it to society (Asgari, 2017). Although data and big data are a key part of smart cities, there has been almost no systematic effort to enable the sharing of the above assets in a reliable way among programs or services (Cao et al., 2020).

Evidence and issues show that on the way to the realization and development of the smart city, there are many challenges related to sharing of data, information, and knowledge produced or collected in the organizations and institutions involved such as the organizations in the field of information and knowledge in the country and Tehran (Tehran Municipality Information and Communication Technology Organization, Secretariat and Center of Smart Tehran, 2018); Undoubtedly without removing these obstacles, smartening and development a smart city is not possible (Jafari Baghiabadi et al., 2022).

Therefore, considering that, on the one hand, the sharing of knowledge assets (data, information, and knowledge) is the main prerequisite for transforming a normal city into a smart city, and on the other hand, considering the importance of cultural-social- activities and facilities in the dimensions and indicators of the smart city, including in the dimensions of life and smart people, the current research tries to answer the question that “what are the causal elements affecting the formation of the current state of inter-organizational knowledge sharing in information and knowledge organizations in Tehran smart city according to the managers of different levels of those organizations?”

2. Literature Review

In this research, we utilized advanced search capabilities in both internal and external databases, employing Boolean operators such as AND and OR, as well as keywords and specialized terms to retrieve relevant research studies. The following sections will review related studies in two parts: the first focusing on the sharing of inter-organizational knowledge (assets) and the second on knowledge sharing (management) in smart cities. It is important to note that within both sections, studies conducted in Iran will be presented first, followed by those conducted abroad, arranged from the most recent to the oldest.

2-1. Inter-organizational knowledge (assets) sharing

In descriptive-survey research, Rahman Seresht and Farzaneh Hasanzadeh (2016) showed that common goals and internalization of the relationship are positively effective in increasing inter-organizational trust, and inter-organizational trust is effective in increasing cooperation and as a result, increasing the

possibility of inter-organizational knowledge sharing. Legzian, Yousefpour, and Taghavi (2015) in survey-analytical research found that high-level leadership, mutual communication and interaction, compatibility, top management support, financial costs, security process, expected benefits, and risks affect the amount of information sharing among government organizations;

In the research of Tashakori and Ehramian (2014), a model based on the four key principles of social exchange theory was presented using the structural equation model as a prerequisite for collaborative relationships and behavior, which shows the relationship between trust, commitment, power, and interaction with information sharing, cooperation and the performance of the supply chain. Experimental results showed that the above four factors determine the extent of information sharing and cooperation in this supply chain.

Nezafati, Ghanbar Tehrani, and Davari (2014) research recognized effective factors in the implementation of a common knowledge network among the collaborating organizations in the petrochemical industry such as factors related to the holder and recipient of knowledge, the platform of collaboration between organizations, the content or nature of knowledge, and the infrastructure of hardware and software technologies. The results also indicated a positive and significant relationship between the effective factors and the successful implementation of the common knowledge network among partner organizations. Nemati Anaraki (2014), in a mixed-methods study aimed at developing a comprehensive model for extra-organizational knowledge sharing among faculty members at universities of medical sciences and research centers in the field of medicine, found that among the three factors investigated, only the organizational factor had a significant impact on the level of knowledge sharing. In contrast, the individual and technical factors did not demonstrate a significant effect. The following section will review related research conducted outside of Iran.

Mohammed Zain, Mohd Zahari, & Mohd Zainol (2023) found that sharing this information between organizations is a challenge because of the huge scale of impacts and potential risks on human life and the economy. Findings revealed problems with information redundancy, lack of tools to manage and distribute information, and coordination issues between organizations in providing real-time information sharing and information management during a disaster.

Azyabi (2023) showed that inter-organizational knowledge sharing among SMEs is not done to a great extent, which means that it is not a common practice among SMEs. The findings showed that less than half of them used training programs, internship programs, research collaborations, and training workshops for small and medium enterprises. Also, this research showed that inter-organizational knowledge sharing increases sales, productivity, profit, organizational assets, and equity. Nezami et al. (2023) showed that the theoretical benefits of inter-organizational collaboration (IOC) are not realized in practice and the management and sharing of data between infrastructure owners in inter-organizational projects (IOP) faces many challenges. The findings indicate that collaboration and data sharing are essential components of horizontal inter-organizational collaboration and play a crucial role in the successful implementation of inter-organizational projects.

In a study, Majuri (2022) examined based on several case studies, the importance of social capital in knowledge transfer. Aspects that limit knowledge transfer were identified and the effects of motivation on collaboration were evaluated. The results showed that although inter-organizational knowledge transfer is widely considered an important source of competition in the existing literature and by innovation policymakers, in some cases, knowledge transfer between companies was minimal and only existed in formal meetings. Surprisingly, the companies shared their R&D results with other network members, but this was not considered very beneficial. Knowledge transfer was limited by changes in consortia, changes in project duration and/or funding, differences in R&D interests, insufficient resources, and the ability to achieve R&D goal(s) without collaboration. In cases with active collaboration, several social capital characteristics in combination with complementary business objectives were perceived as facilitating knowledge transfer.

Zhou, Liu, & Wang (2022) analyzed using a meta-analytic approach, 76 interviews previously collected from three city governments in China under the theoretical lens of integrated social network theory of inter-organizational relations. The results indicated that the sharing of inter-organizational data is influenced by the regulations and key factors governing inter-organizational relationships. Conceptualization of the findings showed that tensions between government

agencies are the main reason for not sharing inter-organizational data. Therefore, effective management of inter-organizational tensions should become a central strategy for increasing inter-organizational data sharing. Garousi Mokhtarzadeh et al. (2021) identified the classification of inter-organizational knowledge mechanisms (IOKMs) and their effect on Networking Capability (NC) to select mechanisms. The findings showed that by implementing a multi-layered decision-making approach, four categories of inter-organizational knowledge mechanisms including person-to-person, co-creation, team-oriented, and information are shown and the effects of their network capabilities are determined. The literature review showed that the number of knowledge mechanisms, especially their inter-organizational types, is increasing. In addition, the research showed that fewer studies have investigated how inter-organizational knowledge mechanisms relate to network capability. In addition, most of the studies on inter-organizational knowledge mechanisms have been conducted in the context of leading firms, and latecomer firms (LCFs) have been neglected.

In research, Marchiori, & Franco (2020) analyzed 102 scientific productions in the world in the web of science related to knowledge transfer in the context of inter-organizational networks. The results showed the most common topics were “innovation” (40 items), “performance” (32 items), and absorption capacity (22 items). Using the co-occurrence technique, three clusters of words were formed. The first cluster (red) analyzes the organization in general, especially from the perspective of innovation processes and organizational changes and the risks of knowledge leakage outside the organizational boundaries. The second cluster (green) is mainly related to network configuration and the capacities of member organizations to absorb and disseminate knowledge. Finally, the third cluster (blue) focuses on the analysis of the role of individuals in networks and organizations, especially on topics such as human capital and social networks, as well as network management and governance. The co-citation network analysis also showed that two main clusters of studies can be identified. The first one covers an approach related to the theory of networks and social networks. The second group works with an approach related to the flow of knowledge in organizations.

Al-Busaidi and Olfman (2017) demonstrated that human factors, particularly those related to knowledge workers and their peers, have a significant direct

impact on the intention to share knowledge via inter-organizational knowledge-sharing systems. Additionally, other factors, including the characteristics of inter-organizational knowledge-sharing systems, organizational attributes, and sector-specific elements, exhibited indirect effects on knowledge workers' intentions to share knowledge through these systems. According to Gil-Garcia and Sayogo (2016), in the era of social problems, a more intelligent, responsive, and efficient governance structure is necessary to use the great ability of people to gather, interact, and collaborate in finding solutions to complex socio-technical challenges. The basis of such a structure is open and shared information. The key to opening and sharing information lies in inter-organizational information sharing and integration. This study identified four statistically significant predictors of inter-organizational information-sharing success. Among them, the compatibility of technical infrastructure and project managers were formally determined as two important predictors explaining the success of inter-organizational information-sharing projects. Chen, Lin, and Yen (2014) presented a model of knowledge sharing within the supply chain. The study examined factors such as shared goals, the embeddedness of social relationships, and influence strategies to determine whether they serve as significant driving forces for the development of inter-organizational trust among various supply chain members. The results indicated that trust is fostered when organizations establish common goals, cultivate social relationships, and implement influence strategies. Furthermore, inter-organizational trust enhances cooperation and facilitates knowledge sharing among organizations.

2-2. Knowledge sharing (management) in smart cities

Esfandiari and Mousakhani (2021) showed the categories of contextual stimuli with an effect on the category of main processes and by using the dimensions of the governing context (structural factors) and intervening conditions (organizational factors) are effective on urban information knowledge management in smart cities, and these factors are also effective on the strategy dimension and ultimately the dissemination dimension of urban results.

In quantitative research, Bokhari and Myeong (2022) investigated the relationship between technology-based knowledge management, innovation,

e-governance, and smart city performance using service science theories based on knowledge management and innovation diffusion. Since the relationship between knowledge management, innovation, e-governance, and e-service provision has been identified in previous research, the researchers believed that these are not only directly related but also have textual and interactive relationships; The analysis of the data from the survey using the questionnaire showed that the direct relationships were textual and interactive because innovation mediates the relationship between knowledge management and the provision of electronic services and e-governance has a moderating role in the relationship between innovation and the provision of electronic service. Kusumastuti et al. (2022) showed that based on the smart people/society dimension, a smart city needs high-quality social interactions and social relationships that help cities communicate with their residents and the outside world. For this purpose, Indonesia's smart cities have developed digital platforms (websites and mobile applications) to publish city programs and information and facilitate information sharing among its actors. The results of the survey conducted in this research indicate that social factors, such as a sense of belonging and the pursuit of fame, play a significant role in influencing actors' willingness to seek information in smart city contexts. Consequently, the intention to seek information is a crucial factor that impacts individuals' willingness to share information on smart city platforms and within their online social networks.

Israilidis, Odusanya, and Mazhar (2021) conducted a documentary study to investigate knowledge management perspectives in smart city research. The findings revealed a growing body of literature that emphasizes the emerging role of smart cities as information centers and knowledge reservoirs. The systematic review identified five distinct themes: strategy and vision, frameworks, enablers and barriers, citizen participation, and benefits. These topics form the basis for developing a future research agenda focused on knowledge-sharing and joint learning between cities through three research directions: socio-technical approaches, knowledge-sharing perspectives, and organizational learning capabilities. The study by Vítor, Rito, and Sargento (2021) demonstrated that the concept of a smart city requires a data platform capable of collecting, processing, and exporting data from millions of sensors sourced from various origins. This platform must accommodate information in diverse formats and employ a scalable

approach to visualize both real-time and historical data. This research proposes a data platform for the Urban Life Technology Laboratory to collect, process, visualize, and activate various types of data, including movement, environmental, and network data. The proposed platform architecture is an open and secure system that enables third parties to collect data and test their solutions.

In a qualitative study, Chun, Nabsiah, & Tan (2022) investigated the successful collaboration between the Smart City Consortium and the Hong Kong government on the Covid-19 dashboard. The findings showed that both interpersonal and inter-organizational trust, dedication, and proactivity of the leaders in the Smart City Consortium were the main contributing factors to why the consortium was able to partner with the Hong Kong government on the COVID-19 dashboard in the first place, secondly, the success in this path was a direct result of effective collaborative knowledge management activities. The social implications of smart city development projects include data sharing in an open environment enabled by software and intermediary tools. Successful projects such as Hong Kong's COVID-19 Dashboard, which serves different audiences, can promote the importance of open data policy for the public benefit. Abdalla, Suresh, and Renukappa (2020) identified three key issues related to the organizational perspectives of smart cities: organizational change, innovation, and digital transformation, as well as the relationship between organizational culture and knowledge management. Accordingly, the cultural transformation required for the development of smart cities needs to facilitate the ability to integrate, create, and reconfigure internal and external competencies to manage knowledge assets that originate from within and outside the boundaries of projects.

De Borba et al. (2020) investigated how knowledge management is related to smart city initiatives through a semi-systematic literature review. The said study, while reviewing the cooperation of two fields in today's evidence, identified gaps regarding the compatibility of knowledge management models in the field of smart cities and the selection of relevant variables for the analysis of knowledge management in smart cities and the impact of knowledge management on the results of city initiatives; Also, the findings showed that the manner of actions related to transparency and governance issues can affect knowledge management or be affected by knowledge management.

Israilidis, Odusanya, and Mazhar (2019) highlighted the absence of knowledge management models for the development of smart cities. Their findings demonstrated how socio-technical approaches can facilitate cooperation and knowledge sharing. Additionally, they provided policy recommendations for local and national governments on how cities can benefit from shifting the focus toward the creation of shared knowledge.

By reviewing the backgrounds in the field of inter-organizational knowledge (assets) sharing, it was found that most of the research focused on identifying current problems and issues, factors affecting inter-organizational knowledge sharing in various fields, knowledge transfer mechanisms and also the benefits and risks of sharing; On the other hand, regarding the sharing (management) of knowledge in smart cities, most of the researches conducted with the dominant approach of review studies and case studies on the necessity and importance of participation and knowledge sharing among different stakeholders and the necessity of knowledge management in smart cities, identifying the influencing factors, the role of technologies and some effective approaches, mechanisms, and tools have been emphasized in this field. According to the review of the above studies, the main purpose of this research is to analyze the causal elements affecting the formation of the current state of inter-organizational knowledge (assets) sharing in information and knowledge organizations located in Tehran smart city according to the four layers of litany, systemic, discourse and metaphor in the causal layered analysis (CLA).

3. Research Method

This research is applied in nature, with a descriptive focus, and employs a mixed-method exploratory approach.

In the present research, first of all, in the qualitative part, the causes affecting the current state of inter-organizational knowledge (assets) sharing among organizations in the field of information and knowledge, such as the National Library and Archives of I.R. Iran, the Iranian Research Institute for Information Science and Technology (IranDoc), the organizations in charge of the public libraries and the university libraries of the country in Tehran have been identified and collected using purposeful judgmental sampling through semi-structured interviews with

14 managers of these organizations; It should be noted that in the judgmental purposeful sampling method, the researcher divides the studied population into several groups based on an attribute that has special importance in the study. Interview questions, as well as data analysis in this section, are designed and conducted based on the four layers of causal layered analysis (CLA). One of the relatively new methods in critical future research is the method of causal layered analysis; This method, which was designed by Inayatullah (1998) and based on his knowledge and personal experiences, is qualitative in terms of method and exploratory in terms of approach (FatehRad et al., 2013).

Causal layered analysis facilitates the construction of valid alternative futures by challenging the current reality, epistemological power structures, and frames of reference. In causal layered analysis, the litany layer represents the visible or objective aspects of the phenomenon in question. The systemic layer investigates the fundamental social, cultural, economic, legal, and technological factors influencing the current process of inter-organizational knowledge sharing. Subsequently, the effective discourse and worldview regarding the current state of inter-organizational knowledge sharing are examined. The metaphor/myth layer, as the deepest level of analysis, encompasses less self-conscious themes related to the phenomenon or issue under investigation (Diba, Gholipour, and Pourezzat, 2019). Figure 1 illustrates the various layers associated with this method, aiming to clarify the role and philosophy of each layer.

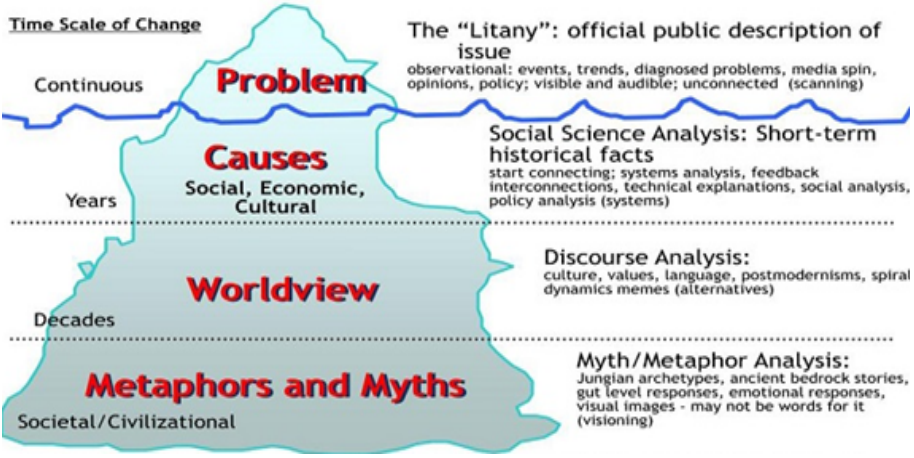


Figure 1. The four layers of issues in causal layer analysis (Slaughter, 2003)

In the next step, in the quantitative part, the identified causes were validated by a researcher-made questionnaire using the Delphi technique. By obtaining and modifying their opinions, the experts determined the agreed main causes in different layers during the two stages. Based on this, the items that did not meet the necessary conditions (mean greater than three and standard deviation less than one) were completely removed or integrated into other items based on the qualitative comments obtained in the previous section. It is necessary to explain that skewness, deviation from skewness, Kurtosis, and deviation from Kurtosis were used to measure the normality of the data; If it is in the "plus/minus two" range, the data is within the average range, and is considered normal. The normality of the data also indicates that the mean and standard deviation among the central and dispersion indicators is a suitable option for use in the Delphi technique.

In summary, the Delphi technique was conducted as illustrated in Figure 2. It is crucial to emphasize that selecting qualified experts is one of the most significant steps in implementing the Delphi technique, as the validity of the results hinges on the competence and knowledge of these individuals. There is no specific formula for determining the number of members in a Delphi panel; however, various perspectives exist regarding the ideal number of participants (Zigillo, 1996). Okoli and Pawlowski (2004) suggest that the average number of Delphi panel members typically ranges from 10 to 18 experts, while Shelton and Kergan (2015) indicate that most Delphi studies utilize groups of 15 to 20 participants, although this number may vary depending on the specific context. In this study, 22 experts from diverse fields related to knowledge management and smart cities were selected as Delphi panel members through purposive sampling. All selected experts held at least a master's degree and possessed a minimum of three years of executive experience at management levels in organizations pertinent to information and knowledge. Subsequently, the experts' opinions were meticulously analyzed, and statistical results were reported using descriptive statistics indicators (mean, standard deviation, skewness, and kurtosis) with the assistance of Excel and SPSS software.

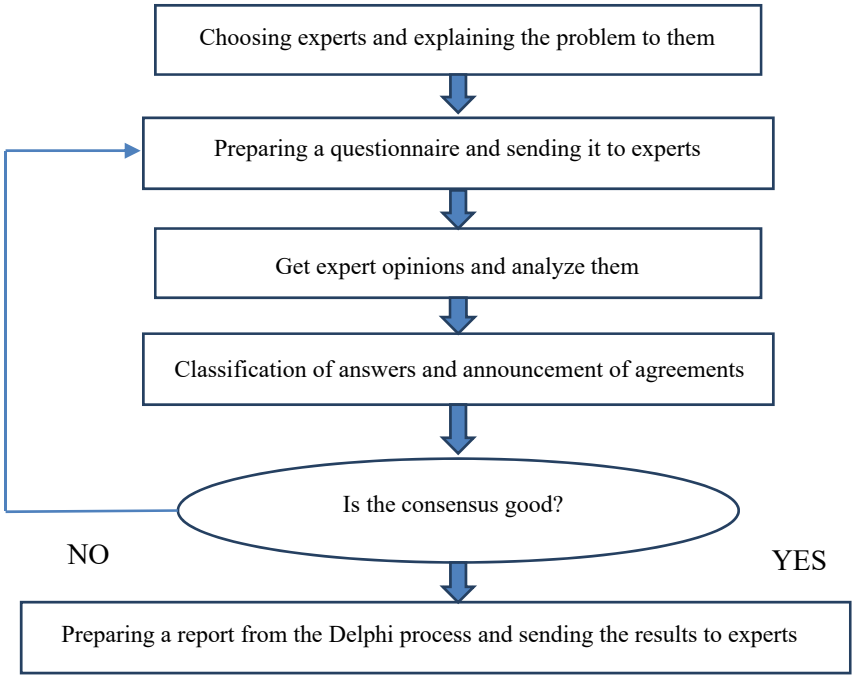


Figure 2. Delphi technique implementation steps (Mirsepasi et al., 2019)

In the current research, "Kendall's coefficient of coordination" was used in SPSS software to determine the level of consensus among panel members. Kendall's coefficient of coordination is a scale to determine the degree of coordination and agreement between several rank categories related to N objects or individuals. Table 1 shows how to interpret the various values of this coefficient.

Table 1. Interpretation of values of Kendall's coordination coefficient

The value of W	Interpretation	Confidence in the order of factors
0.1	Very weak consensus	Not exist
0.3	Weak consensus	Low
0.5	Moderate consensus	Medium
0.7	Strong consensus	High
0.9	Very strong consensus	Very High

The value of this scale is equal to one when there is complete coordination or agreement and zero when there is no coordination at all. Additionally, in the

absence of such consensus, the stability of this coefficient or its slight increase over two consecutive rounds indicates that there has been no improvement in the agreement among members, suggesting that the opinion polling process should be halted. Regarding the validity and reliability of the research tools and the data collected, the criteria of credibility and reliability were employed during the qualitative data collection phase through interviews. Credibility refers to the degree of trust in the authenticity of the findings as perceived by the research participants and within the context in which the research was conducted (Hariri, 2015). For this purpose, strategies of spending a relatively long time with the interviewees, meeting regularly and exchanging opinions and discussions with experts and researchers who do not deal with research, and presenting the information extracted from the interviews to the participants were used. Reliability also means that instead of wanting people to reach the same results in similar conditions, the researcher seeks to convince the reader that the findings are reliable according to the research process. To ensure the research process is traceable and to enable external parties to evaluate and verify the reliability of the findings, an "audit guide" has been developed. This guide comprises recorded interviews, transcriptions of those interviews, an interview guide sheet, a list of interviewees, questions considered by the researcher during data analysis, categories derived from the data, and notes taken by the researcher (Hariri, 2006). Accordingly, an audit guide was prepared for the present study.

In the quantitative section, the face and content validity of the questionnaire were confirmed through the feedback of seven specialists and experts in fields relevant to the current research. To assess the reliability of the instrument, Cronbach's alpha coefficient was employed. The results indicated that the Cronbach's alpha coefficient for both the first and second-round questionnaires exceeded 0.7. Consequently, the questionnaires demonstrated adequate reliability.

4. Analysis of Findings

In line with the answer to the research question, in this section, data analysis is presented in two subsections: causal layered analysis and the Delphi technique.

4-1. Causal Layered Analysis (CLA)

In the first part of the current research, the opinions of managers of information and knowledge organizations in the Tehran smart city were collected regarding the current state of inter-organizational knowledge sharing through interviews based on the four layers of causal layered analysis.

The analysis of the data from the interviews led to the formation of 104 causes in the form of 39 causes in the litany layer, 25 causes in the systemic layer, 21 causes in the discourse layer, and 19 causes in the metaphor layer; In the litany section, items such as “lack of skilled and expert manpower”, “non-recognition of knowledge”, “lack of attention to documentation of knowledge” and “improper allocation and distribution of human and financial resources” have the highest frequency respectively among the comments of the interviewees;

In the systemic part, the causes of “lack of funds and necessary resources”, “lack of necessary infrastructure”, “lack of attention to human and social capital”, “lack of law for sharing and using knowledge assets” and “intellectual property” are the most repeated among the opinions of the interviewees. Meanwhile, in the discourse section, causes such as “concern about losing knowledge”, “organizational structure”, “viewpoint and approach of the organization leader”, “managers’ lack of belief in knowledge”, “selection of senior managers of information and knowledge organizations based of political orientation” and “inter-organizational relations approach” had the most frequency and repetition among the opinions of the interviewees.

In the metaphor layer, the causes of “lack of trust in others”, “not having the necessary ability to share knowledge and not entering into it”, “unconscious and cognitive dimensions”, “unwillingness to share knowledge with others” and “lack of consultation in matters (Not using collective wisdom)” had the most repetition among managers’ comments.

4-2. Delphi

In this step, validation was done to create convergence and determine the degree of agreement on the obtained causes and bring it closer to a more scientific and principled point of view. For this purpose, a questionnaire was designed and sent to 22 experts who had the necessary conditions to participate in the Delphi panel,

and their opinion was asked about the causes of each layer. The findings showed that all the data were within the mean range and therefore normal. The data from the first round of Delphi showed that among the confirmed causes, the highest average of 4.63 was related to the cause of “not recognizing knowledge” and the lowest average value was 3.23 related to the “physical change of the city, and the smartening of Tehran city”. The analysis of the questionnaires of the first round showed that among the 103 causes proposed in different layers, 20 causes need to be modified, deleted, or merged into another cause. Also, experts suggested four causes.

It should be noted that although some of the excluded causes had a mean higher than three, they were removed from the causes because their standard deviation was higher than 1 and this indicates the dispersion of the responses compared to the mean and less agreement among the panel members.

By incorporating the changes identified in the first round of the Delphi implementation, the questionnaire for the second round was developed and distributed to the panel members for additional review and confirmation of the modifications made. In the second-round questionnaire, a description of the applied changes, the previous answers of each member, as well as the average opinions of other panel members were given; Also, the respondents were asked to justify their opinion with the results of the first-round or adjust it if their opinion does not match with the obtained rating.

After implementing the second round of the Delphi method, the findings from the collection of questionnaires are summarized in Table 1. By incorporating the corrections suggested by the experts and redistributing the questionnaire in the second round, the averages increased while the standard deviation decreased. The data analysis revealed that the averages rose in most cases, with only a few instances showing a decrease of approximately 0.01 to 0.03. Given that the overall average was no less than 3.48 and that most averages exceeded 4, this minor difference was not significant. Additionally, a limited number of cases showed equality with the averages from the previous round. Furthermore, the four causes proposed by the experts in the earlier round were confirmed in this round.

Table 1. The results of the second-round of Delphi

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
Litany	Lack of knowledge sharing between information and knowledge centers in Tehran city	4.13	0.504	0.406	0.448	0.187	0.872
	A big gap between the current state and the desired state	4.32	0.468	0.946	0.448	-1.201	0.872
	Lack of smart city thinking in centers and organizations	3.69	0.773	-1.112	0.448	1.798	0.872
	Lack of documentation of actions taken in the direction of smartening and knowledge sharing	4.36	0.763	-0.132	0.448	-0.327	0.872
	Non-recognition of types of knowledge	4.57	0.665	-1.147	0.448	0.736	0.872
	Considering the smart city as just equivalent to technology	3.61	0.721	-0.401	0.456	-0.571	0.866
	The simplistic yet complex attitude of assuming knowledge sharing in the smart city	3.76	0.851	-0.441	0.448	-0.610	0.853

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Superficial conversations about knowledge sharing	3.50	0.598	-1.068	0.448	1.793	0.872
	Non-adherence and commitment to related approvals and regulations	4.35	0.785	-1.067	0.448	1.923	0.872
	Inappropriate administrative bureaucracy, management, and organizational structure	4.08	0.627	-0.459	0.448	-0.532	0.872
	The physical change of the city and smartening of Tehran city	3.48	0.971	-0.201	0.448	-0.822	0.872
	Confusion of organizations	4.29	0.736	-0.938	0.448	1.073	0.872
	The physical change of organizations, especially information and knowledge centers	3.92	0.938	-0.823	0.448	0.122	0.872
	Changing demands and interests of audiences and users	4.40	0.799	-1.640	0.448	1.980	0.872
	Changing patterns, norms, values	4.41	0.684	-0.762	0.448	-0.501	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Changing the nature of assets and funds from physical and tangible to intangible and knowledge	4.43	0.706	-0.988	0.448	1.576	0.872
	Lack of understanding of the positive consequences of knowledge sharing and smartening by managers and employees	4.32	0.523	-0.416	0.448	-0.720	0.872
	Many obstacles and challenges for inter-organizational knowledge sharing	4.42	0.672	-1.184	0.448	1.997	0.872
	The dependence of knowledge sharing on individuals (organizations being person-oriented and not program-oriented)	3.87	0.805	-0.390	0.448	0.30	0.872
	A lot of fluctuation in the implementation of effective measures	3.94	0.745	-0.732	0.448	0.572	0.872
	Lack of effective effort	3.53	0.770	-0.279	0.448	-0.042	0.871

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Restricting organizations' access to the knowledge of other organizations and cultural centers	4.28	0.804	-1.262	0.448	2	0.872
	Lack of attention to the needs of today's citizens	4.36	0.577	-0.416	0.448	-0.720	0.872
	No data collection and extraction	4.49	0.654	-0.416	0.448	-0.720	0.872
	Imitating other countries regardless of localization	4.06	0.509	-0.233	0.448	-0.478	0.872
	Organizations' lack of access to clean and usable data	4.57	0.659	-1.184	0.448	1.992	0.872
	Failure to implement knowledge management and inter-organizational communication	4.62	0.594	-0.274	0.448	-0.766	0.872
	Improper allocation and distribution of human and financial resources	4.44	0.876	-0.873	0.448	-0.030	0.872
	Lack of skilled and specialized manpower	4.56	0.797	-0.384	0.448	-0.826	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
Systemic	Lack of common/ centralized database and knowledge	4.62	0.796	-0.765	0.448	0.109	0.872
	Non-use of smart city technologies and capacities in information and knowledge centers	4.57	0.795	-0.804	0.448	-0.541	0.871
	Non-alignment of political, economic, and social structures of organizations with knowledge sharing and smart city	3.92	0.994	-0.380	0.448	-0.987	0.872
	Failure to pay attention to effective cultural-social factors, economic factors, technological factors, climatic and environmental factors, functional and value factors	3.67	0.998	-0.498	0.448	-0.698	0.872
	Change of organizational plans and policies due to the transfer of governments in periods of 4 or 8 years	4.45	0.774	-0.596	0.448	-0.013	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	The multitude of issues and challenges within the organization	4.04	0.854	-0/874	0.448	0.7	0.872
	The inability of organizations to resolve conflicts of interest	4.67	0.506	-0.237	0.448	-1.999	0.872
	A difference between organizations and centers in terms of mission, field of operation, and target community	4.64	0.509	-0.079	0.448	-2	0.872
	Ignoring meritocracy in the selection and appointment of managers	4.01	0.829	-1.011	0.448	1.203	0.872
	Lack of correct cultural policies	3.85	0.899	-0.816	0.448	0.242	0.872
	Lack of necessary infrastructure	4.67	0.567	-0.596	0.448	-0.013	0.872
	Ignoring human and social capital	4.04	0.854	-0.874	0.448	0.7	0.872
	Lack of knowledge-sharing culture in information and knowledge centers	4.67	0.506	-0.237	0.448	-1.999	0.872
	Lack of correct definition of inter-organizational communication	4.12	0.509	-0.079	0.448	-2	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Failure to realize the smart government	4.22	0.892	-1.177	0.448	1.042	0.872
	Absence of the law of sharing and using the knowledge assets of organizations from each other in the smart city	3.76	0.997	-0.362	0.448	-1.085	0.872
	Lack of attention to organizational culture in terms of knowledge sharing and smart city	3.87	0.967	-0.259	0.448	-0.763	0.872
	Lack of funds and necessary resources	4.22	0.698	-1.068	0.448	2	0.872
	Intellectual Property	4.63	0.548	-0.749	0.448	-1.560	0.872
	Lack and inefficiency of solutions to reach an agreement on the sharing of infrastructure and tools	4.43	0.492	-0.569	0.448	-1.817	0.872
	Lack of necessary preparation	4.58	0.476	-1.247	0.448	-0.736	0.872
	Lack of comprehensive smart urban management	4.11	0.751	-0.777	0.448	-1.102	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Weakness in the intelligent management of the organization	4.33	0.679	-0.530	0.448	-0.650	0.872
	Not using open and connected data	4.36	0.773	-0.596	0.448	-0.427	0.872
	Legal obstacles regarding knowledge sharing and intelligence	4.25	0.940	-0.823	0.448	0.122	0.872
	Absence of a road map (unclear goal and knowledge-sharing strategy)	4.35	0.813	-0.992	0.448	0.753	0.872
	Lack of necessary attention to innovative methods, processes, patterns, and tools such as social innovation, open innovation, crowdsourcing, and the like in solving problems	4.25	0.808	-0.875	0.448	0.029	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
Discourse	A misology discourse	4.27	0.669	-1.255	0.448	1.993	0.872
	Selection of senior managers of information and knowledge centers based on political orientation	4.64	0.641	-0.726	0.448	-0.366	0.872
	Globalization	3.92	0.912	-0.879	0.448	0.354	0.872
	Diversification	3.93	0.890	-0.595	0.448	-0.721	0.872
	Lack of attention to basic knowledge	4.64	0.456	-1.155	0.448	1.950	0.872
	Lack of attention to the knowledge economy	3.98	0.961	-0.843	0.448	0.033	0.872
	Political interference in cultural organizations	4.25	0.698	-1.068	0.448	2	0.872
	Discrimination and conflict between cultural organizations	4.31	0.656	-0.319	0.448	-0.6	0.872
	Lack of collective thinking and wisdom	4.64	0.481	-0.233	0.448	-0.478	0.872
	Leadership perspective and approach	4.64	0.599	-0.094	0.448	-0.366	0.872
	Inter-organizational relations approach	4.22	0.577	-0.016	0.448	0.138	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	The degree of similarity between organizations from different aspects	4	0.940	-1.424	0.448	2	0.872
	Organizational Structure	3.95	0.684	-0.726	0.448	0.376	0.872
	Culture of trial and error	3.95	0.886	-0.684	0.448	-0.105	0.872
	The culture governing the citizens	3.93	0.986	-0.477	0.448	-0.623	0.872
	The culture of consumerism	3.99	0.899	-0.441	0.448	-0.610	0.872
	Prioritizing individual/ organizational interests over collective interests	3.96	0.854	-0.726	0.448	0.376	0.872
	Monopolization	4.17	0.855	-0.684	0.448	-0.105	0.872
	Worry about losing knowledge	4.46	0.492	-0.569	0.448	-1.817	0.872
Metaphor	Knowledge as physical objects	4.02	0.565	-1.247	0.448	-0.736	0.872
	Blaming metaphor	4.11	0.751	-0.777	0.448	-1.102	0.872
	Knowledge as a garden A garden without a gardener	4.33	0.679	-0.530	0.448	-0.650	0.872
	Snow wall metaphor	4.2	0.847	-0.597	0.448	0.167	0.872
	Lockable box	4.41	0.636	-0.594	0.448	-0.484	0.872

Layer	Cause	Mean	Standard deviation	Skewness	Deviation from Skewness	Kurtosis	Deviation from Kurtosis
	Knowledge as a Fluid	4.12	0.662	-0.165	0.448	-0.568	0.872
	Bipolar or hierarchical knowledge	4.26	0.813	-0.992	0.447	-0.753	0.872
	Knowledge is a personal asset	4.33	0.620	-0.348	0.448	-0.541	0.872

According to Table 1, in total, 91 causes were validated in the form of 31 causes in the litany layer, 25 causes in the systemic layer, 19 causes in the discourse layer, and 8 causes in the metaphor layer. In this round, in total, the causes of “Bipolar or hierarchical knowledge”, “organizations’ inability to resolve conflicts of interest” and “lack of necessary infrastructure” had the highest mean with a value of 4.67. The causes of “selection of senior managers of information and knowledge centers based on political orientation”, “not paying attention to become knowledge-base” and “leadership perspective and approach” had the next mean with a value of 4.64; Also, the causes of “lack of common/centralized data and knowledge base and platform” and “non-implementation of knowledge management and inter-organizational communication” with a value of 4.62 were in the third place in terms of the mean. The lowest mean value was 3.48 and belongs to the cause of “physical change of the city and smartening of Tehran city”. The next lowest mean value was 3.5, which was related to the cause of “superficial conversations about knowledge sharing”. The next lowest mean was 3.53 related to the cause of “lack of effective effort”.

Since in the second round of distributing the questionnaires, the standard deviation of none of the causes was not higher than 1 and the mean of none of the causes was less than 3, no cause was removed and all cases were approved; Also, the experts did not have an opinion regarding the increase, decrease or change of causes; Because in the present study, the number of Delphi panel members was 22, and the value of Kendall’s coordination coefficient was calculated as 0.734 in the first round and 0.742 in the second round, which shows an increase of only

0.008; Therefore, a strong consensus on the factors under study was obtained and a high degree of confidence was obtained regarding the order of the factors. Therefore, due to the reduction of the standard deviation and the insignificant growth of the coordination coefficient related to the second round compared to the first round, the survey process through the Delphi panel was stopped; In total, the steps of the Delphi technique are presented in Table 2.

Table 2. The steps of the Delphi technique according to the four layers of litany, systemic, discourse, and metaphor

Layer	Round number	Initial identified causes	Final identified causes
Litany	2	39	31
Systemic	2	25	25
Discourse	2	20	19
Metaphor	2	19	15

5. Conclusion

This research was done to analyze the causal factors affecting the formation of the current state of inter-organizational knowledge (assets) sharing in information and knowledge organizations located in Tehran based on the opinions of managers and four layers of causal layered analysis including litany, systemic, discourse and metaphor layers and then validation of causes was done using Delphi technique and panel of experimental experts.

In the interview section, the results of the research showed that in the litany, causes such as “lack of skilled and expert manpower”, “non-recognition of knowledge”, “lack of attention to documentation of knowledge” and “improper allocation and distribution of human and financial resources” respectively, were the most frequent among the opinions of the interviewees; In the systemic part, the causes of “lack of funds and necessary resources”, “lack of necessary infrastructure”, “lack of attention to human and social capital”, “lack of law for sharing and using knowledge assets” and “intellectual property” were the most repeated among the opinions of the interviewees. Meanwhile, in the discourse section, causes such as “concern about losing knowledge”, “organizational structure”, “viewpoint and approach of the organization leader”, “managers’ lack of

belief in knowledge", "selection of senior managers of information and knowledge centers based on political orientation" and "inter-organizational relations approach" had the most frequency and repetition among the opinions of the interviewees. In the metaphor layer, the causes of "lack of trust in others", "not having the necessary ability to share knowledge and not entering into it", "unconscious and cognitive dimensions", "unwillingness to share knowledge with others" and "lack of consultation in matters (Not using collective wisdom" had the most repetition among managers' comments.

From this point of view, according to the mentioned cases, the main challenge in the field of inter-organizational knowledge sharing in information and knowledge organizations in the context of Tehran smart city has its roots in the deepest layers, including the layers of discourse and metaphor, and to solve the current problems and challenges, it is necessary to focus on the above layers.

Next, in the validation section of the causes identified through the Delphi technique, the results of the research showed items such as "lack of common/ centralized data and knowledge base and platform", "lack of implementation of knowledge management and inter-organizational communication", "lack of skilled and expert manpower" and "non-recognition of types of knowledge" respectively have the highest Averages among Delphi panel comments. Mohammed Zain, Mohd Zahari and Mohd Zainol (2023) also identified problems regarding information redundancy, lack of tools for information management and distribution, and coordination issues between organizations in information sharing and real-time information management in the length of a disaster. The results of Azyabi (2023) indicated that the sharing of inter-organizational knowledge among small and medium-sized enterprises is limited. Similarly, Majuri (2022) found that, in some instances, knowledge transfer between companies was minimal, occurring primarily during formal meetings, and was not particularly beneficial. Nezami et al. (2023) revealed that the theoretical advantages of inter-organizational cooperation are not realized in practice, as the management and sharing of data among infrastructure owners in inter-organizational projects face numerous challenges. Kusumastuti et al. (2022) demonstrated that the development of digital platforms, such as websites and mobile applications, is essential for disseminating city programs and information, as well as facilitating information

sharing among stakeholders. The study by Vítor, Rito, and Sargento (2021) emphasized that the concept of a smart city necessitates the support of a data platform capable of integrating data from millions of sensors sourced from various origins, accommodating information in multiple formats, and employing a scalable approach to collect, process, and export both real-time and historical data.

The above findings showed that although the problems related to the litany layer can be identified and tracked quickly and clearly, they are undoubtedly the result of other important factors; In other words, some of the challenges have taken on an objective appearance and deeper solutions should be sought for them. Challenges such as lack of common/centralized data and knowledge base and platform, improper allocation and distribution of human and financial resources, lack of smart city thinking in centers and organizations, lack of necessary attention to types of knowledge in organizations and their identification, etc., not only do they have the ability to be investigated as a cause and effect, but they can be simultaneously estimated as indicators of the main problem situation. In many cases, by providing solutions at deeper levels, the challenges of this level are systematically affected and solved. On the other hand, when the negative consequences are at the levels of execution and implementation, the current state can be improved with the necessary changes and reforms in the management system and the expert body of the current. Also, with these indicators, we can be aware of the progress and efficiency of the main solutions and provide a suitable basis for evaluating the state of the system and the success of the solutions.

The results of the research showed the causes of “lack of funds and necessary resources”, “lack of necessary infrastructure”, “neglect of human and social capital”, “lack of law for sharing and using knowledge assets”, “intellectual property” and “inability of organizations to solve the conflict of interest” had the highest mean among the Delphi panel comments in the systemic layer. In Nemati Anaraki’s research (2014), the effect of the organizational factor on the amount of extra-organizational knowledge sharing was found to be significant. According to Gil-Garcia and Sayogo (2016), a more intelligent, responsive, and efficient governance structure that promotes open and shared information is essential for addressing complex socio-technical challenges. In this context, the opening and sharing of information play a crucial role in integrating inter-organizational data. Additionally,

the compatibility of technical infrastructure and the role of project managers have been identified as two significant predictors of the success of inter-organizational information-sharing initiatives. In Nezafti's research, Ghanbar Tehrani and Davari (2014) factors related to the owner and receiver of knowledge, the platform of cooperation between organizations, the content or nature of knowledge, and the infrastructure of hard and software technologies were recognized as effective factors. Mohammed Zain, Mohd Zahari, and Mohd Zainol (2023) also found it necessary to review existing policies and develop clear guidelines to address issues and improve the overall coordination of humanitarian logistics support. Zhou, Liu, and Wang (2022) also indicated that inter-organizational data sharing is influenced by the structure and determinants of inter-organizational relationships. Majuri's results (2022) also emphasized that knowledge transfer is hindered by changes in consortia, changes in project duration and/or budget, differences in research and development interests, insufficient resources, and the ability to achieve research and development goal(s) and is limited without cooperation. Bigdeli, Kamal, and De Cesare (2013) also found that the process of sharing electronic information in government-to-government projects is influenced by various factors such as environment, organization, business processes, and technological factors and not only by technical issues. Kusumastuti et al. (2022) showed that social factors (sense of belonging and reputation) play a dominant role in determining actors' willingness to search for information on smart city platforms. In turn, information-seeking intention is a key factor that affects people's intention to share information on smart city platforms and in their online social networks.

The above findings indicate that the structures, laws, rules, and regulations are among the existing elements and tools in the systemic layer. New objective actions and manifestations relying on macro structures in different social, cultural, political, economic, etc. fields can take on the appearance of independence, evolution, criticism, and reproduction. Inter-organizational knowledge sharing in a smart city is not an exception to this rule, and it needs to gain social, political, economic, cultural, and other acceptances for further development and crystallization. To face the above challenges, it is possible to invite experts from the social, economic, cultural, social and political fields under the umbrella of creating and developing a smart city in the dimensions of people and smart life,

and specifically organizations in the field of information and knowledge, and with interactive responsiveness, monitored the needs of this area and solved them to an acceptable level.

In the discourse layer, the results showed that the causes such as “selection of senior managers of information and knowledge organizations based on political orientation”, “concern about the loss of knowledge”, “organizational structure”, “viewpoint and approach of the organization leader”, “lack of attention to becoming knowledge-based” and “Inter-organizational relations approach” had the highest mean among the Delphi panel comments. These findings showed that many challenges and problems were influenced by the discourse layer, in such a way that it shapes the worldview and intellectual system of different actors. In other words, beliefs and intellectual paradigms are the drivers in this layer. One of the most effective ways to change the foundations of the worldview is discourse creation. Legzian, Yousefpour, and Taghavi (2015) also found that high-level leadership, mutual communication and interaction, compatibility, top management support, financial costs, security process, benefits, and expected risks on the amount of information sharing between government organizations are influential. The analysis of the data from the Bokhari and Myeong (2022) survey indicated that the direct relationships between technology-based knowledge management, innovation, e-governance, and smart city performance are contextual and interactive because innovation mediates the relationship between management knowledge and e-service provision and e-governance has a moderating role in the relationship between innovation and e-service provision. In Israelidis, Odusanya, and Mazhar’s (2021) systematic review of related studies, five different themes of strategy and vision, frameworks, enablers and inhibitors, citizen participation, and benefits are used as a basis for developing a future research agenda focused on knowledge sharing and joint learning between cities through three research directions identified socio-technical approaches, knowledge sharing perspectives and organizational learning capabilities. Abdalla, Suresh, & Renukappa, (2020) recognized three key issues including organizational perspectives of smart cities; organizational change, innovation, and digital transformation; And the relationship between organizational culture and knowledge management as important and effective issues in this field. Israilidis, Odusanya & Mazhar (2019) showed how

socio-technical approaches can help support collaboration and knowledge sharing.

The results of the research showed that at the level of metaphor, the causes of " Knowledge as physical objects", "Blaming metaphor", "Knowledge as a garden A garden without a gardener", "Snow wall metaphor", "Lockable box", "Knowledge as a Fluid", "Bipolar or hierarchical knowledge", & "knowledge is a personal asset" had the highest mean among the Delphi panel comments. These findings showed that the deepest depth of any methodology and epistemology is in the metaphor layer. Assumptions from the past have always been placed among the mental models of people and different actors and have made thoughts. In this regard, Rahman Seresht and Farzaneh Hassanzadeh (2016) showed that common goals and internalization of the relationship are positively effective in increasing inter-organizational trust, and inter-organizational trust is effective in increasing cooperation and, as a result, increasing the possibility of inter-organizational knowledge sharing. In the model presented by Tashakori and Ahramian (2014), the relationship between trust, commitment, power, and reciprocity with information sharing and cooperation and supply chain performance was shown. The findings of Garousi Mokhtarzadeh et al. (2021) showed that by implementing a multi-layered decision-making approach, four categories of inter-organizational knowledge mechanisms, including person-to-person, co-creation, team-oriented, and information, along with their network capability effects, can be detected. The results of Marchiori, & Franco (2020) showed that the most common topics and discourses in this field were "innovation", "performance" and "absorption capacity". The co-citation network analysis also showed that two main clusters of studies can be identified. The first cluster is related to an approach related to the theory of networks and social networks, and the second cluster is related to the flow of knowledge in organizations. Chen, Lin, & Yen (2014) also found that trust is exercised when organizations develop common goals, form social relationships, and adopt influence strategies. In addition, inter-organizational trust leads to better inter-organizational cooperation and knowledge sharing. The findings of Chun, Nabsiah, & Tan (2022) showed that both interpersonal and inter-organizational trust, dedication, and activeness of leaders in the smart city consortium are the main contributing factors in this regard. The findings of De Borba et al. (2020) indicated that the manner of actions related to transparency and governance

issues can affect knowledge management. Finally, the most important causes identified in each of the four layers are based on experts' opinions (Figure 3).

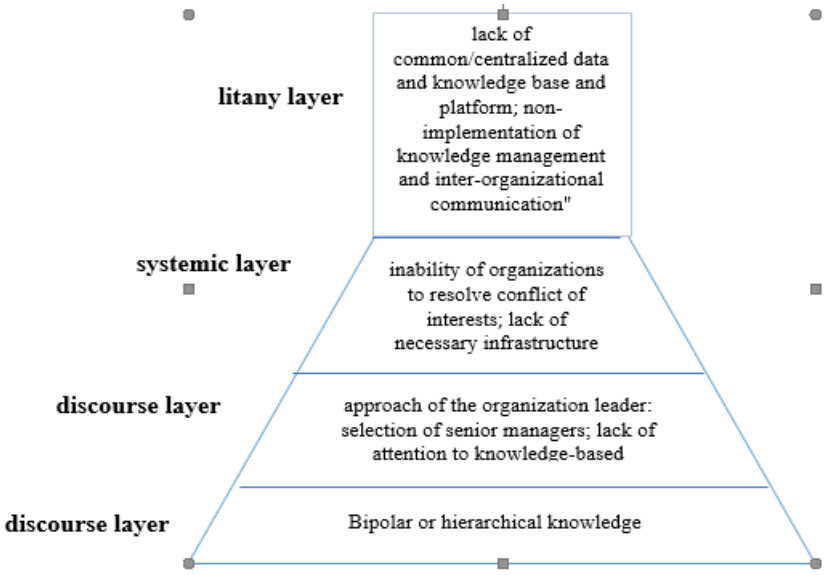


Figure 3. The most important identified causes affecting the current state of inter-organizational knowledge sharing based on four layers in causal layer analysis

Since one of the first steps in smartening is to identify the current state of cities and different players in this field from different aspects, the present study tried to examine the current state of organizations in the field of information and knowledge in terms of inter-organizational knowledge sharing based on causal factors and elements. Undoubtedly, in the next steps, planning should be done to improve the current state based on the infrastructure and then the necessary foundations. In other words, in order to solve the problems and challenges of the current state of inter-organizational knowledge sharing in information and knowledge organizations, it is suggested that scenarios designed and implemented with a priority on creating discourse and changing the metaphors of actors in this field with a focus on solving the problems caused by the bipolar or hierarchical knowledge metaphor and Discourses on the leadership approach of organizations and the selection of managers and the knowledge-based approach (figure 3).

References

Abdalla, W., Renukappa, S., & Suresh, S. 2022. Managing COVID-19-related knowledge: A smart cities perspective. *Knowledge and Process Management*, *30* (1), 87-109. https://doi.org/10.1002/kpm.1706

Abdalla, W., Suresh, S., & Renukappa, S. (2020). Managing knowledge in the context of smart cities: An organizational cultural perspective. *Journal of Entrepreneurship, Management and Innovation*, *16* (4), 47-85. https://www.ceeol.com/search/article-detail?id=909083

Aghdasi, M., & Bazrafshan, M. (2015). Determining effective factors on inter-organizational knowledge sharing in collaborative processes (Case study of Tax Affairs Organization). *Operations research in its applications*, *12* (1), 1-19. (In Persian). https://jamlu.liau.ac.ir/article-1-1039-fa.html

Al-Busaidi, K.A., & Olfman, L. (2017). Knowledge sharing through inter-organizational knowledge sharing systems. *VINE Journal of Information and Knowledge Management Systems*, *47* (1), 110-136. https://doi.org/10.1108/VJIKMS-05-2016-0019

Amirpourkalmeh, H., & Serati Kish, A. (2016). Knowledge management based on the Internet of Things in the smart city, *National Congress of Modern Urban Planning and Management*, Tehran. https://civilica.com/doc/686728/

Asgari, M. (2017). Sustainable smart city and solutions to achieve it. Retrievable at: https://kargosha.com/fa/content/id/1019 (in Persian)

Azyabi, N. (2023). The impact of ICT on inter-organizational knowledge sharing for SMEs growth. *Business Informatics,* 17 (1), 66-85. http://dx.doi.org/10.17323/2587-814X.2023.1.66.85 (in Russian)

Balle, A.R., Steffen, M.O., Curado, C., & Oliveira, M. (2019). Interorganizational knowledge sharing in a science and technology park: the use of knowledge sharing mechanisms. *Journal of Knowledge Management*, *23* (10), 2016-2038. https://doi.org/10.1108/JKM-05-2018-0328

Bazargan, A. (2010). *An introduction to qualitative and mixed research methods*. Tehran: Didar. ISBN: 9786001041976.

Bianchini, D., & Avila, I. 2014. Smart cities and their smart decisions: Ethical considerations. *IEEE Technology and Society Magazine*, *33* (1), 34-40. http://dx.doi.org/10.1109/MTS.2014.2301854

Bigdeli, M. (2015). Challenges of evaluating the effectiveness of cultural activities in cultural organizations of the country. *Challenges of the World, 2* (2), 5-36.

Bigdeli, A. Z., Kamal, M. M., & De Cesare, S. (2013). Electronic information sharing in local government authorities: Factors influencing the decision-making process. *International Journal of Information Management*, *33* (5), 816-830. https://doi.org/10.1016/j.

ijinfomgt.2013.05.008

Bokhari, S. A. A., & Myeong, S. (2022). Artificial intelligence-based technological-oriented knowledge management, innovation, and e-service delivery in smart cities: Moderating role of e-governance. *Applied Sciences*, *12* (17), 8732. https://doi.org/10.3390/app12178732

Boyes, B. (2016). Smart cities and knowledge management. *RealKM Magazine*, 22 July 2016. https://realkm.com/2016/07/22/smart-cities-and-knowledge-management/

Cao, Q. H., Giyyarpuram, M., Farahbakhsh, R., & Crespi, N. (2020). Policy-based usage control for a trustworthy data sharing platform in smart cities. *Future Generation Computer Systems*, *107*, 998-1010. https://doi.org/10.1016/j.future.2017.05.039

Chen, Y. H., Lin, T. P., & Yen, D. C. (2014). How to facilitate inter-organizational knowledge sharing: The impact of trust. *Information & Management*, *51* (5), 568-578. https://doi.org/10.1016/j.im.2014.03.007

Chun, D. J. Y., Nabsiah, W. A., & Tan, C. L. (2022). Successful collaboration between smart city consortium and Hong Kong Government in Covid-19 dashboard: the case of leadership in practice. *International Journal of Organizational Analysis*, *30* (5), 1172-1187. https://doi.org/10.1108/IJOA-01-2021-2604

Cobb, S. (2016). Data privacy and data protection: US law and legislation. An ESET White Paper, 1-15. https://web-assets.esetstatic.com/wls/2018/01/US-data-privacy-legislation-white-paper.pdf

Davari, S., Nezafati, N., & Ghanbar Tehrani, N. (2014). Investigating effective factors in the implementation of a common knowledge network between partner organizations (case study of the petrochemical industry). *The 8th National Conference and the 2nd International Conference on Knowledge Management*, Tehran.

de Borba, D., Palacios, R. A., Luciano, E. M., & Chaves, M. S. (2020). The contribution of knowledge management to smart cities for innovation: proposal for a prescriptive framework and a research agenda. *International Journal of Innovation*, *8* (3), 516-540. https://doi.org/10.5585/iji.v8i3.18543

Esfandiari, M., & Mousakhani, M. (2021). Development of a native and paradigmatic model of knowledge management for urban information monitoring in smart cities. *Journal of Urban Economics and Management*, *9* (34), 101-118. https://iueam.ir/article-1-1684-fa.html (in Persian)

FatehRad, M., Jalilvand, M., Moulaie, M., Samiei, S., & Nasrollahi vasati, L. (2013). Methodological coordinates of the metadiscipline of future research as a single metaparadigm. *Interdisciplinary Studies in Humanities*, *6* (1), 135-161. https://doi.org/10.7508/isih.2014.21.007 (in Persian)

Ferronato, P., & Ruecker, S. (2018). Smart citizenship: Designing the interaction between citizens and smart cities. in Storni, C., Leahy, K., McMahon, M., Lloyd, P. and Bohemia,

E. (eds.), *Design as a catalyst for change - DRS International Conference 2018*, 25-28 June, Limerick, Ireland. https://doi.org/10.21606/drs.2018.480

Garousi Mokhtarzadeh, N., Amoozad Mahdiraji, H., Jafarpanah, I., Jafari-Sadeghi, V., & Bresciani, S. (2021). Classification of inter-organizational knowledge mechanisms and their effects on networking capability: A multi-layer decision making approach. *Journal of Knowledge Management*, *25* (7), 1665-1688. https://doi.org/10.1108/JKM-07-2020-0579

Gil-Garcia, J. R., & Sayogo, D. S. (2016). Government inter-organizational information sharing initiatives: Understanding the main determinants of success. *Government Information Quarterly*, *33* (3), 572-582. https://doi.org/10.1016/j.giq.2016.01.006

Hariri, N. (2015). *Principles and methods of qualitative research*. Tehran: Islamic Azad University, Science and Research Unit. ISSN: 9789644503498.

Inayatullah, S. (1998). Causal layered analysis: Poststructuralism as method. *Futures*, *30* (8), 815-829. https://doi.org/10.1016/S0016-3287(98)00086-X

Israilidis, J., Odusanya, K., & Mazhar, M. U. (2021). Exploring knowledge management perspectives in smart city research: A review and future research agenda. *International Journal of Information Management*, *56*, 101989. https://doi.org/10.1016/j.ijinfomgt.2019.07.015

Jafari Baghiabadi, S., Noruzi, A., Vasfi, M. R., & Moradi, S. (2022). The need to share inter-organizational knowledge in smartening information and knowledge organizations and centers in smart cities. *Library and Information Science Research*, *12* (2), 5-28. https://doi.org/10.22067/infosci.2022.73379.1068

Jafari Baghiabadi, S., & Jabbari, L. (2019). Urban observatory: A step towards knowledge management in a smart city. University of Tehran. Tehran: *2nd Interactive Information Retrieval Conference*. (in Persian).

Kalantari Oskouee, A., Saber Khoushe Mehr, M. (2017). Identifying and prioritizing the challenges of sharing data and spatial information. *Quarterly of Geographical Data (SEPEHR)*, 27 (106), 37-55. https://doi.org/10.22131/sepehr.2018.32331 (in Persian).

Kitchin, R. (2016). The ethics of smart cities and urban science. *Philosophical Transactions of The Royal Society A: Mathematical, Physical and Engineering Sciences*, 374 (2083), 20160115. https://doi.org/10.1098/rsta.2016.0115

Kusumastuti, R. D., Nurmala, N., Rouli, J., & Herdiansyah, H. 2022. Analyzing the factors that influence the seeking and sharing of information on the smart city digital platform: Empirical evidence from Indonesia. *Technology in Society*, 68, 101876.

Kusumastuti, R. D., Nurmala, N., Rouli, J., & Herdiansyah, H. (2022). Analyzing the factors that influence the seeking and sharing of information on the smart city digital platform: Empirical evidence from Indonesia. *Technology in Society*, *68*, 101876. https://doi.org/10.1016/j.techsoc.2022.101876

Laurini, R. (2021). A primer of knowledge management for smart city governance. *Land Use Policy*, 111, 104832. https://doi.org/10.1016/j.landusepol.2020.104832

Lagzian, M., Yoosefpour, A., & Taghavi, S. F. (2016). An investigation of factors influencing G2G sharing information among government agencies. *Public Organizations Management*, *4* (4), 11-32. https://ipom.journals.pnu.ac.ir/article_3218.html

Marchiori, D., & Franco, M. (2020). Knowledge transfer in the context of inter-organizational networks: Foundations and intellectual structures. *Journal of Innovation & Knowledge*, *5* (2), 130-139. https://doi.org/10.1016/j.jik.2019.02.001

Majuri, M. (2022). Inter-firm knowledge transfer in R&D project networks: A multiple case study. *Technovation*, 115, 102475. https://doi.org/10.1016/j.technovation.2022.102475

Mirsepasi, N., Tolouei Ashlaghi, A., Memarzadeh, G. and Peidayi, M. (2010). Designing a human resource excellence model in Iranian public sectors using the fuzzy Delphi technique. *Journal of Management Future Research*, *21* (87), 1-22. https://srb.sanad.iau.ir/en/Article/786247 (in Persian).

Mohammed Zain, R., Mohd Zahari, H., & Mohd Zainol, N. A. (2023). Inter-agency information sharing coordination on humanitarian logistics support for urban disaster management in Kuala Lumpur. *Frontiers in Sustainable Cities*, *5*, 1149454. https://doi.org/10.3389/frsc.2023.1149454

Nemati Anarki, L. (2014). Extra-organizational knowledge sharing: presenting a comprehensive model. *Modern Medical Information*, *1* (1), 10-23. http://jmis.hums.ac.ir/article-1-30-en.html (in Persian).

Nezami, M. R., de Bruijne, M. L., Hertogh, M. J., & Bakker, H. L. (2022). Collaboration and data sharing in inter-organizational infrastructure construction projects. *Sustainability*, *14* (24), 16835. https://doi.org/10.3390/su142416835

Rahman Seresht, H., Farzaneh Hassanzadeh, J. (2016). Facilitating cooperation and sharing of inter-organizational knowledge through inter-organizational trust. *Journal of Public Administration Perspective*, *8* (2), 15-35. https://jpap.sbu.ac.ir/article_96031.html (in Persian).

Rashidi, H.R., Mirshah Jafari, S.A., & Sharif Khalifeh Soltani, M. (2004). Investigating the process of planning cultural activities of Isfahan state universities during the second and third development plans of the country. *Journal of Psychology and Educational*, 35 (1), 199-220. https://jpsyedu.ut.ac.ir/article_10589.html(in Persian).

Razavizadeh, A., & Mofidi, M. (2017). *Smart city*. Tehran: Simaye Danesh. (in Persian).

Slaughter, R. (2003). Integral operating system drawing on Inayatullah. in *The World Futures Society Pre-Conference Course*, July.

Sorkhkamal, K., Biravandzade, M., & Zanjerchi, S. (2012). Levelling cities from cultural development points of view in Khorasan Razavi Province. *Spatial Planning*, 1 (2), 95-108. https://sppl.ui.ac.ir/article_15901.html (in Persian).

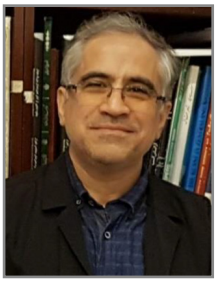
Tashakori, L., & Ehramian, N. (2014). Role of information sharing and inter agency collaboration in performance of supply chain. *2nd International Conference on Modern Research's in Management, Economic and Accounting*. Kualalumpur, Malaysia

Vítor, G., Rito, P., & Sargento, S. (2021). Smart City Data Platform for Real-Time Processing and Data Sharing. In *2021 IEEE Symposium on Computers and Communications (ISCC)*, (pp. 1-7). IEEE. https://doi.org/10.1109/ISCC53001.2021.9631427

Zhou, L., Liu, C., & Wang, X. (2022). Understanding interagency relationships in the sharing of government data: a meta-analysis. In Proceedings of ISIC: the information behaviour conference, Berlin, Germany. *Information Research,* 27 (Special issue), ISIC 2246. https://doi.org/10.47989/irisic2246

Somayyeh Jafari Baghiabadi

Born in 1985, she graduated with a PhD in Knowledge and Information Sciences, specializing in Information and Knowledge Management, from the University of Tehran in 2023. She is currently the head of the Research and Planning Unit in the Public Relations and Information Department at Shahid Beheshti University, as well as a university lecturer. Her research interests include knowledge management, data science, smart cities, and research methods..



Mohammad Reza Vasfi

Born in 1965, he graduated with a PhD in Culture and Civilization of Islam and Christianity from the Faculty of Theology at St. Joseph University of Lebanon in 2004. He has served as the cultural advisor of the Islamic Republic of Iran in Austria for some time and is currently an associate professor in the Department of Information Science and Knowledge Management at the University of Tehran, College of Management. His areas of specialization include knowledge management, research methods, smart cities, and archival studies.

Shima Moradi

Born in 1981, she graduated with a PhD in Knowledge and Information Sciences from the Islamic Azad University of Science and Research in Tehran in 2012. She is currently the manager of the library at St. Augustine University of Medical Sciences in California and a part-time faculty member at El Camino College in Los Angeles and Irvine. Her research interests include open science, scholarly communication, and artificial intelligence in higher education.

Alireza Noruzi

Born in 1976, he graduated with a PhD in Information and Communication Sciences from the University of Aix-Marseille, France, and completed a postdoctoral fellowship in the same field at the University of Montreal, Canada. He is currently an associate professor in the Department of Information Science and Knowledge Management at the University of Tehran, College of Management. His areas of specialization include information representation and retrieval, knowledge management, knowledge governance, scientometrics, artificial intelligence, and natural language processing. He serves as the editor-in-chief of the journal of Informology.