

Original Article

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Lived experience of understanding the smart city with an emphasis on social and economic dimensions (A case study of Tehran citizens)

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Abstract

The expansion of information technologies has made the smart city an important approach in urban planning and management. However, realizing the smart city depends not only on developing technological infrastructure but also on citizens' trust and participation. The present study aimed to explain Tehran citizens' lived experience of the smart city using a qualitative approach based on Strauss and Corbin's grounded theory. Data were collected through in-depth, semi-structured interviews with 19 Tehran citizens using theoretical sampling and were analyzed through open, axial, and selective coding with MAXQDA software. The findings showed that "ambiguity of the situation toward smartification" is the core category of citizens' experience, formed by the simultaneous occurrence of two conflicting orientations: fear and hope toward smartification. Weak technological literacy and education, privacy concerns, the possibility of job elimination, emerging social harms, weak infrastructure, and inefficient urban management were the main conditions shaping this ambiguity, while ease of access to services, improved quality of life, expanded communication, rapid access to knowledge and information, and new opportunities fostered hope toward smartification. To confront this situation, citizens proposed strategies such as improving technological literacy, demand-making, participation, increasing transparency, public education, legal reform, and better institutional coordination. The outcome of this process was the conditional acceptance of the smart city, whereby trust, equitable access, data security, and attention to citizens' real needs were considered essential conditions for the success of Tehran's smartification.

Keywords

Smart city
smart economy
smart governance
smart living
smart people

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1. Introduction

The Industrial Revolution, beginning in the late eighteenth century with the expansion of steam power, electricity, mass production, and subsequently information and communication technologies, transformed the modes of production, settlement, employment, and social life. In its fourth generation, through the convergence of nanotechnology, biotechnology, information and communication technologies, and cognitive sciences, technology has permeated all levels of life (Jourshari et al., 2026). Simultaneously with the rapid growth of urbanization, population increase, concentration of amenities, traffic, pollution, inequality, and the increasing complexity of urban needs, approaches such as the information city, digital city, and electronic city emerged to improve management and quality of life; however, due to their focus on limited dimensions of technology and electronic services, they were unable to respond to all the social, economic, cultural, environmental, and managerial dimensions of the city. Against this background, the concept of the smart city emerged in the 1990s, concurrent with the expansion of the internet, and was considered a new paradigm

for sustainable urban development (Neirotti et al., 2014). The smart city is a city that, by leveraging information and communication technology, real-time data, and appropriate management mechanisms, contributes to improving quality of life, increasing economic productivity, upgrading services, improving transportation, protecting the environment, and strengthening governance; therefore, technology in it is not the ultimate goal but a tool for achieving the social, economic, environmental, and managerial objectives of the city (Mohammadali et al., 2021; Hooshmand, 2018). Nam and Pardo categorized the smart city's elements into three groups: technology, people, and institutions. Technology includes hardware, software, and communication infrastructure; people include human capital, education, creativity, and participation; and institutions include policy-making, management, and governance. Accordingly, smart living, smart people, smart environment, smart economy, smart mobility, and smart governance are the six main components of the smart city, and realizing them requires a link among technological infrastructure, human capital, and participatory governance (Nam & Pardo, 2011).

Table 1. Definitions of smart city indicators based on the Griffinger method

Indicators	Definitions
Smart people	It refers to providing citizens with a high level of education and describes the quality of social interactions, cultural awareness, intellectual development, and the level of public participation in social life. In this domain, smart cities seek to become cities with educated and culturally aware citizens.
Smart living	.It aims to improve citizens' quality of life through healthy and safe conditions. In smart cities, citizens have easy and rapid access to healthcare and urban services. With a focus on improving quality of life, smart cities provide opportunities for measures such as home automation (smart homes, smart-building services, etc.) and services that improve citizens' access to healthcare.
Smart environment	It emphasizes resource management and sustainable urban planning. By reducing pollution and protecting the environment, the natural beauty of the city can be enhanced. Smart cities seek to reduce energy consumption.
Smart mobility	It supports more efficient communication and transport systems with lower environmental impacts and uses information and communication technologies to improve efficiency. A common measure implemented by cities and municipalities is to better meet citizens' mobility needs through extensive urban planning.
Smart governance	It refers to a transparent governance system that enables citizens to participate in decision-making. Information and communication technology infrastructure also provides citizens with easy access to urban-management information, while an integrated system can remove barriers to communication and cooperation.
Smart economy	It refers to a city's overall competitiveness based on its innovative approach to business, research and development expenditure, entrepreneurial opportunities, productivity, labor-market flexibility, and the city's economic role in national and international markets. By creating and maintaining social-network groups for investors and cooperating with stakeholders such as universities, companies, and NGOs to strengthen innovation through expert groups, a smart city can improve its economic position.

From this perspective, the smart city is not merely a technical project but a socio-technical process in which technology, citizens, and urban institutions interact. Communication infrastructure and digital

systems provide the means for connecting citizens, organizations, and businesses. However, without institutional cooperation, education, technological literacy, trust, and public participation, they do not

lead to social value and public welfare (Hui et al., 2023). This view aligns with the social shaping and interactional approaches to technology, since technologies are shaped within social, cultural, economic, and political relations, and their consequences are not the same for different groups. Therefore, a smart city can enhance quality of life only when it aligns with citizens' real needs, culture, and conditions, and when it considers equity in access, privacy, education, and participation (Tavakol, 2011). This issue is even more important in Tehran, as it faces population growth, concentrated amenities, traffic, air pollution, social and economic inequalities, complex urban management structure, and cultural diversity. Urbanization in developing countries, including Iran, has often been accompanied by intense and unbalanced growth, extensive migration, concentration of amenities in large cities, informal settlements, and the spread of social and economic harms (Farnaz et al., 2021). On the other hand, Iranian cities, amid the transition from tradition to modernity, also face the need to enter an information- and knowledge-based society (Zadeh et al., 2021). Therefore, Tehran's smartification cannot merely follow the technological patterns of developed cities; it must align with the historical, social, economic, and cultural structures of Iranian society (Zhang & Hong, 2024). Some smart urban services, such as e-government, online payment systems, the Tehran Man application, transportation services, urban toll payments, and non-in-person services, have made it possible to reduce in-person visits, save time and cost, and better manage intra-city trips. Nevertheless, these benefits depend on appropriate communication infrastructure, a reliable database, institutional coordination, and citizens' trust. Unreliable information or citizens' concerns about how their personal data is collected and used can reduce participation and create a gap between the official goals of smartification and citizens' actual experience (Bastos et al., 2022).

Therefore, attention to citizens' lived experience throughout smartification is necessary. Citizens are the best source for identifying the real needs, challenges, and consequences of technology in everyday life. Examining their experience can reveal the extent to which smart services meet the needs of diverse social and economic groups, and whether they increase welfare and equity or may exacerbate the digital divide and the isolation of disadvantaged groups. Despite the importance of this issue, a significant portion of smart city studies have focused

on technical infrastructure, technology readiness indicators, digital services, or the efficiency of urban management, and the lived experience of citizens, particularly in connection with social and economic dimensions, has been less examined in depth and as a process. Moreover, it remains unclear how Tehran citizens make sense of the smart city, what strategies they use to confront this situation, and what consequences this experience has for their trust, participation, access equity, and quality of life. The research gap addressed here lies precisely at this point. Accordingly, the present study aims to understand and present a clear picture of Tehran citizens' understanding of the smart city, with a focus on social and economic dimensions. In this regard, we examine the causal, contextual, and intervening factors that affect citizens' experience, their strategies for confronting smartification, and the consequences of this process for their social and economic life. The innovation of this research lies in studying the smart city not merely as a set of technological infrastructures and systems, but as a meaningful social experience from the perspective of Tehran citizens.

2. Literature review

In recent years, studies on the smart city have gradually shifted from a sole focus on technological infrastructure and the efficiency of urban services toward greater attention to citizens, social participation, quality of life, and the economic and social consequences of smartification. In domestic studies, Akhavan and colleagues, aiming to identify the dimensions, components, and indicators of citizenship education in managing future smart cities using factor analysis, identified components such as altruism, socio-political behavior, environment and sustainable development, and smart governance. The study's findings show that realizing the smart city does not depend solely on technological development, and the social and behavioral characteristics and capacities of citizens are also important in the smartification process (Akhavan et al., 2022). Sedighi and colleagues, in examining the challenges of cybersecurity and privacy in Tehran metropolis's transition toward a smart city, identified weak legislation, lack of secure communication, and insecurity in data and protocol exchange as key obstacles. These findings show that citizens' perception of the smart city can be influenced by issues beyond the quality of technological services, including security, trust, and privacy protection (Sedighi et al., 2022).

Likewise, Rajabi and colleagues, in a study on the realization of the smart city in District 2 of Tehran with an emphasis on urban quality of life, showed that the components of “smart people” and “smart living” have considerable importance in realizing the smart city, and that there is a bidirectional relationship between the smart city and quality of life (Jourshari et al., 2026). In another study, Balouchi and colleagues, by designing a smart city model based on the assumptions of new public services, emphasized the necessity of simultaneously attending to technological infrastructure, human and social capital, and integrated urban management, and showed that weak human and institutional infrastructure can be a major obstacle on the path to smartification (Balouchi et al., 2021). Overall, domestic studies show that human, social, institutional, and quality-of-life dimensions, alongside technology, are important elements of the smart city; nevertheless, a significant portion of these studies have adopted a quantitative approach to measuring indicators, assessing the current situation, or identifying obstacles, and less attention has been paid to how citizens experience and make sense of the “smartification of the city” in their daily lives.

In international studies, attention to citizens’ position in the smart city has increased. Choo and colleagues, in a study on citizen participation in smart city planning in South Korea, by examining smart city programs and interviewing participants in the planning process, showed that citizen participation is, in many cases, used only in the early stages of idea formation and vision-setting, and does not persist in later stages of planning; therefore, for the realization of an inclusive smart city, citizen participation must be attended to throughout all stages of the planning process (Choo et al., 2023). Likewise, a case study of the Toronto Quayside project showed that although many smart city projects present themselves as citizen-centered, citizens’ real role and power in decision-making may remain limited in practice. This study emphasizes the gap between the “discourse of citizen-centeredness” and the “actual extent of citizens’ agency” (Nelischer, 2024). Furthermore, Radchenko, focusing directly on the economic and social impacts of smart cities and using the perspectives of various stakeholders, including citizens, showed that the consequences of the smart city in social and economic domains can be both positive and negative, and that understanding these consequences requires simultaneous attention to the perspectives of different stakeholder groups (Radchenko, 2023). In a more recent study, research

on smart city development in the university city of Kashiwanoha in Japan, using documents, field observation, and interviews with citizens and planners, also showed that the active participation of citizens and the creation of opportunities for the formation of local community can contribute to innovation and the development of the smart city; nevertheless, achieving a balance between technology-driven smartification and a community-centered approach remains a fundamental challenge (Florentin et al., 2024).

The synthesis of previous studies shows that the smart city literature is shifting from a predominantly technology-centered approach toward a human-centered, participatory, and social approach; nevertheless, several fundamental shortcomings remain. First, a large portion of domestic studies have focused on measuring indicators, ranking dimensions, assessing the extent of smart city realization, and identifying obstacles. Consequently, they have mostly answered the question of “what is the state of the smart city?” or “what factors affect its realization?” rather than how citizens actually experience and make sense of the smart city. Second, in studies that have addressed citizens, participation has often been treated as an indicator or a governance tool, with less attention paid to citizens’ everyday experience, feelings, perceptions, expectations, concerns, and interpretations regarding the social and economic consequences of smartification. Third, many studies have examined social and economic dimensions in the form of a set of predetermined indicators, whereas the meaning of the smart city being “social” or “economic” from citizens’ perspective may differ from conventional indicators. On the other hand, although international studies have shown greater attention to citizen-centeredness, participation, and social and economic consequences, they have mainly focused on specific projects and cases in developed cities or specific smart city programs, and their findings cannot be generalized without attention to the institutional, social, economic, and cultural context of Iranian cities. Accordingly, the main gap in the present study is not merely the absence of studies on the smart city, but the absence of a deep understanding of citizens’ lived experience in confronting the concept of the smart city and how they perceive its social and economic dimensions. The innovation of the present study lies in that, instead of imposing predetermined indicators and components on citizens’ experience, it attempts, through their narratives and lived experiences, to reveal the meaning of the smart city, the perceived

social and economic consequences, and the opportunities, challenges, expectations, and concerns related to it, from the citizens' own point of view.

3. Methodology

The present study used a qualitative approach and Strauss and Corbin's grounded theory. Grounded theory is an inductive, exploratory method that enables the researcher to extract concepts, categories, and their relationships based on real data and explain them as a conceptual model. This method was selected due to the research aim of understanding the Tehran citizens' experience with smartification and explaining the effective factors, strategies, and consequences involved. Data were collected through library research and 19 in-depth, semi-structured interviews with Tehran citizens. Participants were Tehran residents with experience using or encountering at least one smart technology or service, such as urban applications, online payment services, transportation systems, e-government services, online shopping, medical services, or other digital services. In selecting the sample, an effort was made to achieve, as much as possible, appropriate diversity in terms of age, gender, level of education, employment status, place of residence, length of residence in Tehran, and degree of familiarity with technology, since citizens' experience of smartification can be influenced by these characteristics. Specifically, the presence of different age groups of women and men, individuals with different levels of education, employed people, students, homemakers, retirees, and job seekers made it possible to examine citizens' diverse experiences and perspectives regarding the process of urban smartification.

The inclusion criteria for the study consisted of being at least 18 years of age, residing in the city of Tehran, having experience using or encountering one of the smart services or technologies, the ability to express personal experiences and views, and providing informed consent to participate in the interview. The experience of encountering technology was not limited to specialized or continuous use of technology, but also included the everyday use of services such as electronic payment, online shopping, navigation, urban services, government systems, medical services, and digital communications. A participant's withdrawal at any stage, unwillingness to continue the interview, an important part of the conversation remaining incomplete, or the emergence of a lack of relevant experience with the topic were also considered

exclusion criteria. To increase sample diversity and strengthen the transferability of the findings, the participants' demographic and technological characteristics were examined and recorded. The degree of familiarity with technology was classified into three levels – low, moderate, and high – based on participants' self-reports and the type and extent of their use of digital tools and services. Low familiarity referred to limited and mostly necessity-driven use of digital services, moderate familiarity referred to relatively regular use of a few services or applications, and high familiarity referred to extensive and continuous use of various services, the ability to learn new systems, and independent use of digital tools. Participants' information was recorded in coded form to preserve their confidentiality. This information is not presented with the aim of statistical generalization of the findings but is reported to illustrate the diversity of experiences, to explain the social context of the research, and to enable the reader to judge the transferability of the findings.

The interview guide was designed in a semi-structured manner, based on open-ended and exploratory questions. The main themes of the interview included experience using smartphones and applications, the experience of first encountering technology, life changes before and after using smart tools, the effects of smartification on social and economic life, the environment, employment, entrepreneurship, transportation, quality of life, trust, privacy, the role of citizens and urban managers, and strategies for smart city development. The six components of the smart city, including smart living, smart people, smart environment, smart economy, smart mobility, and smart governance, were treated, at the initial design stage, as sensitizing concepts rather than as fixed, predetermined categories. These components were used solely to cover the conceptual scope of the topic, and the data were not forcibly classified according to them. Participants were free to express any experience, concern, perception, or meaning they had regarding smartification without being confined to the six-fold framework. Throughout the interviews, follow-up questions such as "What do you mean by this experience?", "What factor gave rise to this feeling?", "Have you had a different experience?", and "What consequence did this situation have for your life?" were used in accordance with emerging concepts. For example, the issue of trust in providing personal information to government or municipal systems was examined through open-ended questions about

experience, feelings, reasons for trust or distrust, and their consequences, rather than being posed as a closed or binary question. Furthermore, as data analysis progressed, the way certain questions were framed, the order of themes, and supplementary questions were revised based on emerging concepts; therefore, the interview guide was not a fixed and unchangeable instrument throughout the research.

Data collection and analysis were carried out simultaneously, and the analytical process was grounded in constant comparison. Participants' responses were compared with one another, along with different parts of each interview, the extracted codes, similar and different cases, and existing theoretical concepts. This comparison was carried out with the aim of identifying similarities, differences, the conditions shaping the concepts, the dimensions of the categories, and their consequences. During the analysis, analytical memos were recorded regarding initial impressions, the characteristics and dimensions of the concepts, the possible relationships among categories, deviant or negative cases, and the information needs of the research. These memos were used in selecting subsequent participants, revising the wording of certain questions, examining the relationships among categories, and forming the final model. Sampling initially began purposively, and after the emergence of initial concepts, theoretical sampling continued. In theoretical sampling, the selection of subsequent participants was carried out not merely to increase the number of interviews but based on concepts and categories that, in the analysis of previous interviews, required further examination, completion, or comparison. For example, when concepts such as weak digital literacy, concerns about privacy, inequality in access, the experience of the elderly, differences among occupational groups, or difficulty in using systems became prominent, participants with relevant experience were selected to enrich the categories. Therefore, theoretical sampling in this study meant moving from initial data toward individuals and experiences that could contribute to the development of the theory and a more precise explanation of the relationships among categories.

Data analysis was carried out in three stages: open, axial, and selective coding. In the open coding stage, the interview transcripts were studied several times, and meaning units related to the topic were identified. Codes such as "concern about the disclosure of personal information," "difficulty using systems," "time saving," "distrust of institutions managing data," "weak

digital literacy," "inequality in access," "fear of job elimination," "ease of receiving services," "reduction in in-person visits," and "dependence on mobile phones" were then extracted from the data. Open codes were derived directly from the interviews' content and were not imposed on the data in advance. In the axial coding stage, the open codes were compared based on conceptual similarity, the conditions of their formation, actions, interactions, and consequences, and were organized into subcategories and main categories. At this stage, the position of each category within the paradigm model, including causal conditions, contextual conditions, intervening conditions, strategies, and consequences, was examined. In the selective coding stage, the core category was selected, and its relationship with the other categories was explained. Based on the analysis conducted, "ambiguity of the situation toward smartification" was identified as the core phenomenon. In total, 668 open codes, 133 axial codes, and 19 selective codes were extracted as causal, contextual, and intervening conditions, strategies, and consequences. The management and organization of the data were carried out using MAXQDA 2020 software; nevertheless, the software was used solely for storing, retrieving, categorizing, and managing the data, while the interpretation of the data, constant comparison, category formation, and the selection of the core category were carried out by the researcher. Initial signs of theoretical saturation were observed from the sixteenth interview onward; however, to ensure the conceptual adequacy of the categories, to examine deviant and negative cases, and to clarify the relationships among the causal, contextual, and intervening conditions, strategies, and consequences, interviews continued up to the nineteenth participant. Theoretical saturation in this study was established when new interviews no longer generated new concepts or main categories, when they further completed the characteristics and dimensions of existing categories, and when the relationships among the categories reached an acceptable level of explanation. The decision to stop data collection was not solely due to repeated information or a lack of new concepts. It was also influenced by the adequacy of the theoretical framework and the model's effectiveness in explaining the relationships among the various categories.

To assess the quality of the findings, the criteria of credibility, dependability, confirmability, and transferability were used. Credibility was examined

through the researcher's continuous presence during data collection and analysis, repeated returns to the raw data, constant comparison of the data, examination of deviant cases, and member checking of the initial results with three well-informed and knowledgeable participants. These three individuals were not selected as a statistical representation of all participants; they were chosen based on their level of awareness of the topic, their ability to explain their experience, and their active participation in the interviews, to examine the degree of correspondence between the researcher's interpretation and the field data. Dependability and confirmability were enhanced by recording the stages of the research, maintaining analytical memos, documenting changes to the interview guide, recording decisions related to theoretical sampling, and reviewing the codes and categories by two experts familiar with the grounded theory method and the topic of the smart city. In cases of disagreement, the codes and categories were examined and revised by returning to the interview

transcripts and comparing them with the raw data. Furthermore, the pathway from open codes to axial codes, main categories, and the core category was documented to allow the researcher's inferential process to be traced. To strengthen transferability, the characteristics of the participants, the research's social context, the inclusion and exclusion criteria, data collection method, the stages of analysis, and the conditions shaping the findings were reported transparently. Additionally, the results were evaluated with two individuals outside the sample with technology-use experience and social conditions similar to those of the participants. These two individuals assessed the comprehensibility, relevance, and fit of the findings in a similar situation, and their review was not equivalent to statistical generalization or peer review. In this way, an effort was made to present the pathway of data collection, analysis, sampling, theoretical saturation, and validation of the findings clearly and traceably, while preserving the qualitative and theory-driven nature of the research.

Table 2. Author's coding example

Coding example				
Core phenomenon	Open code	Axial coding	Selective coding	Theoretical dimension
Ambiguity regarding the status of smartification (fears and hopes — an uncertain future)	- Fear of the elderly and less-literate individuals being left behind by digital processes - Confusion when using urban portals and applications - Inability to distinguish credible information from fake information - Concern over the recording and storage of daily behaviors - Fear of misuse of images, voice, and personal data - Feeling of being turned into an object of control and monitoring - Distress over constant dependence on mobile phones and the internet - Disruption of daily affairs during network or power outages - Feeling that past skills and work experience have become worthless - Decline in family visits and face-to-face conversations - Constant comparison of oneself with others on social media - Mental fatigue from continuous presence in digital environments	-Educational weakness and technological unawareness -The dark side of cyberspace and confusion when using urban portals and applications -Technological dependence - Concern about recording and storing everyday behaviors -Elimination of some traditional jobs - Emergence of new social harms -Inability to keep pace with technological changes -Decline in soft skills and increase in psychological disorders -Weakness and lack of coherence in urban management	Fears of smartification	Causal conditions

Coding example				
Core phenomenon	Open code	Axial coding	Selective coding	Theoretical dimension
Ambiguity regarding the status of smartification (fears and hopes — an uncertain future)	- Finding faster routes for completing daily tasks - Real-time information on traffic and urban transport conditions - Receiving instant alerts about urban hazards and crises - Ability to track citizen requests and complaints online - Reduction of unnecessary trips within the city - Savings in water, electricity, and fuel consumption - Rapid identification of polluted/problematic areas of the city - Wider access to services for people with limited ability - More direct communication between citizens and city officials - Easier participation in surveys and local decision-making - Emergence of new opportunities for digital businesses - Simultaneous access to multiple services through a single unified platform	- Accumulation/burden of the city's social and environmental problems - Ease of access to services and facilities - Improvement in individual quality of life - Development of the communication network - Potential for social advancement - Ease of access to knowledge and information - Creating the groundwork for carrying out simultaneous activities	Hopes of smartification	Causal conditions

4. Findings

4.1. Central Phenomenon

The core phenomenon in the grounded theory method functions as a key concept that emerges during the research process and serves as a guide for further data collection and analysis. This phenomenon is, in a sense, the research axis and directs theoretical sampling and data analysis. The core phenomenon is the main focus of the research, on which a theory is developed to explain the process, action, or interaction under study. In this research, fear and hope toward smartification in the city is a concept that has been extracted from within the axial categories and has emerged from the interviews. Fear refers to the challenges, problems, and weaknesses in the smartification process, while hope refers to the opportunities, potentials, and possible benefits of this process; together, they have generated a sense of ambiguity of the situation among the participants. On the one hand, fear toward smartification in the city refers to issues such as a lack of attention to social needs, the emergence of security problems, a lack of transparency in the decision-making process, as well as increased public concern about privacy, a sense of enslavement to technology, and issues related to the lack of coordination among the various components, local institutions, and private companies in the

smartification process. On the other hand, hope toward smartification in the city refers to the potential benefits of this process. These benefits include improving citizens' quality of life, enabling social advancement, improving urban communication, increasing security, improving public transportation, and facilitating access to knowledge, news, and information in the smart city, as well as creating new employment opportunities – albeit with the implicit risk of eliminating some traditional jobs – developing modern public spaces, and providing information and communication technology infrastructure in the city.

4.2. Causal conditions: refer to the factors that give rise to a phenomenon. The causal conditions of the core phenomenon are divided into two general categories, fear and hope, each of which has further subcategories.

4.2.1. Fear

- Educational deficiency and technological illiteracy: weakness in education, information dissemination, and technological awareness can be considered one of the main factors creating a state of ambiguity and fear/hope among citizens toward urban smartification. These weaknesses can lead to a number of issues.

Code 4: "Sometimes citizens are unaware. Just think,

there's so much advertising on radio and television, but we don't have advertisements like 'Dear citizen, you can come here and convey your views about urban issues to us.'"

Lack of awareness: citizens may, due to a lack of awareness about the technologies used in smartification, be unable to fully understand and evaluate how these technologies can improve urban life.

Lack of proper training: in the absence of adequate and appropriate training on smartification, citizens may encounter complex and unfamiliar concepts, increasing ambiguity and fear in their minds.

Deficiency in information dissemination: inadequate and insufficient information dissemination about smartification projects and programs can undermine citizens' transparency and trust in this process, resulting in greater ambiguity, fear, and hope.

- The dark side of cyberspace and the illusory beauty of technology: from the participants' point of view, cyberspace has dark aspects that can have negative effects on their lives and increase psychological disturbances.

Code 5: "They're working a lot on these issues now, and I mean spaces like the metaverse that are so tied to the phone, and kids have their financial systems in their own wallets, their lives are in it, their gaming is happening in it too, and especially these new glasses that sync with phones – meaning now you can easily have a completely virtual space of your own life on glasses, of the AR type, augmented reality, and this could be combined with virtual reality too – augmented reality and virtual reality are being combined on phone systems. I think this could become much more destructive in the future – someone sitting in a small room but doing very big and even dangerous things, hacking a bank, scamming a large number of people, and this could cause much more harm – apart from the more traditional things everyone talks about, and I tried to say it differently."

Conformity with reality: images and information published in cyberspace may not show the full reality of smartification projects. This can create ambiguity and uncertainty among citizens.

Increased expectations: artificial beauty and image editing in cyberspace may create unrealistic expectations among citizens. When the reality of smartification projects is compared with these images, citizens may feel fear and disappointment.

Lack of trust: since images and information in

cyberspace can be altered and edited, citizens may distrust the information provided. This can create ambiguity and fear regarding the accuracy and feasibility of urban smartification projects.

- Concern for privacy protection: protecting individuals' privacy is one of the important issues that, from the participants' perspective, must be attended to in the field of smartification. Smartification means the use of advanced technologies to optimize urban services and life. However, the protection of individuals' privacy should not be disregarded by smartification. Citizens fear that, with smart systems expanded in the city, their privacy will be violated and their personal information will fall into the hands of other individuals or organizations.

Code 13: "The reason I don't have some apps on my phone is exactly this – I don't trust how my information is used."

- Technological slavery: enslavement to technology means excessive dependence on modern devices and technologies. This dependence may lead to a loss of balance between online and offline life, reduced social interaction, and increased indifference toward traditional activities and manual skills.

Code 18: "Sometimes you feel like everything is in the hands of this technology, as if the reins of life have fallen into its hands and you no longer have any control over anything, and this is very bad – both being so dependent on it that you can't set it aside, and being so overwhelmed by it that it scares you as to what will happen in the end, what our future will look like, whether people will turn into machines and robots."

- The elimination of certain traditional occupations: smartification and technological advancement may lead to the elimination of jobs, increasing unemployment, and this is one of the factors creating a sense of fear and ambiguity toward technology and the smartification of Tehran among citizens, a process that is raised from the participants' point of view.

Code 13: "Regarding jobs too, yes, well, it has eliminated some jobs, but it has also created some; online jobs don't need a building, a store, a shop that you necessarily have to visit in person; you can see it online, choose, and request it to be delivered to you.

And of course, when there's no shop, no seller, no store, no staff, certainly some jobs decrease. On the other hand, well, these deliveries and motorcycle couriers are needed to bring the purchase, so those jobs have been added."

- The prevalence of emerging social harms: from the participants' point of view, emerging harms include: the impact of cyberspace on children, addiction to mobile phones and cyberspace, and behavioral addiction. Addiction to cyberspace and mobile phones is a serious issue that, from many participants' perspective, is one of the factors creating fear and ambiguity toward smartification. People addicted to the internet may spend a great deal of time in cyberspace. This can reduce social interaction, disrupt personal relationships, and increase isolation and loneliness among individuals.

Code 2: "That's how it is now too. Someone is chatting with their boyfriend, and that photo, in my opinion, isn't just for that one person; it might be shown to several other people."

- The prevalence of emerging issues in the family institution: family conflicts, extreme desire for variety, lack of supervision and control over children, communication problems between spouses, extramarital relationships, and so forth are among the important issues that trouble the family institution. With advances in technology and access to the internet and social media, young people today easily encounter new information and developments that influence them. This information can reach them through various communication tools and affect them.

Code 18: "People have become variety-seeking along this path, which in my view has affected families, spouses, and even children. Today they want it this way, tomorrow they want it another way – that's exactly it. Infidelity has increased because people are getting used to this state."

- Inability to keep pace with technological changes: fear of falling behind in technology can be raised as one of the factors creating a state of ambiguity and fear among citizens toward the smartification of the city. This is because citizens may feel that not using or not being sufficiently familiar with new technologies could cause them to fall behind others or fail to make optimal use of smart urban services – and today this issue has no relation whatsoever to the level of one's academic education.

Code 18: "Everything is changing so fast; I keep thinking about what to do so I don't fall behind, but I feel like I can't. Now that we're literate, we still can't keep up with this pace of change; imagine what happens to someone who is illiterate, or older, or simply lacks certain abilities."

- Physical inactivity and physical health problems: a

lack of physical activity and abandoning it can lead to physical problems such as muscle weakness, weight gain, reduced flexibility, and problems related to body orientation. These problems can lead to physical limitations and reduced quality of life; people may also engage less in movement and exercise. This can lead to physical inactivity and problems such as obesity, cardiovascular diseases, increased stress, and an increased risk of chronic diseases.

Code 12: "That's right, society is moving more toward individualism, and this reduces people's connections with one another and makes people more distant from each other, and one result of this could even be that people no longer feel like moving, and their physical activity decreases, which certainly has health consequences."

- The reduction of soft skills and the increase in psychological disorders: the decline in soft skills includes a decline in problem-solving skills, resilience, memory, and deep human connections. A decline in problem-solving skills can be one of the influential factors in creating fear and ambiguity about urban smartification, which is highlighted from the participants' perspective. This can stem from various causes, including excessive dependence on smart technologies, reduced focus and attention to issues and problems, and an increased reliance on technical and mechanical solutions.

Code 7: "As a result, social interactions have weakened. For example, walking down the street, people grab each other's collars over the smallest problem; this means problem-solving has become hard and unfamiliar for them."

- Weakness and lack of cohesion in urban management: weakness in city management and the lack of integration among organizations can be raised as main factors creating ambiguity and fear toward smartification and technology among citizens. These weaknesses may create uncertainty and undermine citizens' trust in the urban smartification process. A lack of coordination and cooperation among various urban organizations and institutions, a lack of integration in city management, political and social problems at the managerial level of society, the absence of comprehensive strategies in city administration, and weakness in the transition to smart urban management can lead to ambiguities regarding the goals and strategies of urban smartification.

Code 9: "I think part of it is also duplicate efforts, I

mean programs that are created in parallel; if these had proper interaction with each other, this could be resolved. We now have Taghche, and we also have Fidibo – both are book applications, and some books actually exist in both; if these two had proper interaction, they could become a comprehensive source of access to books. Now imagine the entire management system of society is like this.”

- The accumulation of the city’s social and environmental problems: high population, traffic, and pollution are among the issues that many participants mentioned and consider problematic, with various effects on their daily life and quality of life. Some participants view these issues as an obstacle to easy access to social and cultural services and feel that, due to traffic and pollution, access to cultural, educational, and health centers has been limited, generating a sense of ambiguity as to why the smartification of the city – a topic that has been discussed for years and has already begun in Tehran – has failed to reduce the city’s problems, while urban problems, including transportation and environmental problems, continue to increase day by day. If this issue is not resolved, it could lead to a decline in quality of life and increased stress and concern regarding smartification.

Code 1: “I really love the sky being blue, and I love the ground being green. Yesterday I went to a medical supply store that I needed, a small shop that was in the process of moving boxes around –the only thing that caught my attention was a small window, but there was a big tree that had grown [there].”

4.2.2. Hope

- Ease of access to services and amenities: ease of access to services, from the participants’ point of view, includes: shopping services, banking and money transfer services, cultural and recreational services, transportation, health and medical services, municipal and e-government services, and education. Smartification, in fact, refers to applying technologies to urban resources and services. This process saves citizens’ time and energy and improves their quality of life.

Code 9: “Before, yes, you had to go to the bank, take a number, fill out the form. Then... you’d wait for your turn to hand in the form.”

- Improved quality of individual life: an increase in quality of life, from the participants’ point of view, acts as a factor of encouragement and a source of satisfaction with the smartification of Tehran, and is

among the positive effects of technology. Examples raised by participants include: increased sense of security, savings in time and cost, self-sufficiency for people with disabilities, self-sufficiency for the elderly, and general comfort and welfare.

Code 14: “Well, it’s gotten a lot better; for example, when I want to buy something for my wife, I send her the photo, she says okay, and I buy it.”

- Development of the communication network: the development of the communication network is raised by participants as a factor of satisfaction and hope regarding smartification in Tehran. Examples include an increase in the number of friends and the ability to communicate remotely. With the rapid growth of technology and the advancement of artificial intelligence, communication networks have become the society’s social nerve system.

Code 4: “What caught my attention most at the time was that I saw that you could apparently communicate with others for free, or exchange text messages.”

- The possibility of social advancement: the possibility of individual social advancement, as a factor of hope in urban smartification, means the creation of opportunities for individuals’ personal and social growth and development in a city. When people feel that, through personal advancement, they can improve their personal and social life, this increases hope and trust in urban smartification.

Code 7: “Yes, certainly in healthcare and psychology, people introduce their doctors and psychologists to each other; they visit less through billboards or by passing by; our introductions have become easier, meaning a person comes across a post, sees the content, engages with it, and gets in touch.”

- Ease of access to knowledge and information: from the participants’ point of view, examples of this include the educational aspect of cyberspace, environmental knowledge, and news and information. Cyberspace education, as a positive cause of smartification, has provided participants with a new understanding of education and learning. From the participants’ perspective, cyberspace can provide diverse and engaging educational content that traditional methods of education, such as libraries and schools, have not been able to deliver as directly and immediately. Easy, quick access to current news and information is also a factor that has created a sense of hope and satisfaction with the smartification process for participants.

Code 12: “Yes, well, I’ve learned a lot of things from it, but only if you choose to learn something positive from those programs, or if you want to go after something negative.”

- Creating the groundwork for performing simultaneous activities: technological advancements have significantly contributed to creating a suitable environment for performing simultaneous activities. Integrating technologies such as automation and communication tools has allowed us to perform multiple tasks efficiently. These technologies provide real-time collaboration platforms, seamless data sharing, and improved connectivity, allowing tasks to be carried out simultaneously across different locations and time zones.

Code 17: “You know, one advantage of this technology was that you could, while sitting at home or wherever, or even while traveling, do your work remotely at the same time, doing several things together.”

4.3. Strategies: strategies refer to the methods or tactics that individuals or groups employ to manage, control, or change phenomena. As indicated, strategies are divided into two categories, individual and macro-level, each of which has further subcategories.

4.3.1. Individual

- Enhancing technological literacy: increasing the level of technological literacy means citizens’ familiarity with and mastery of modern technologies and digital tools. This helps citizens make the best use of new technologies in urban smartification and keep pace with technological progress. As technological literacy increases, citizens can better use the services and facilities of urban smartification, engage better with smart urban systems, and experience improved quality of urban life. Some methods include: studying educational resources, searching in cyberspace, participating in online/in-person training courses, and communicating with and asking questions of those skilled in the field of technology.

Code 18: “There’s a lot you can do; you can go get training yourself on Instagram, Google, YouTube, etc. – there are lots of instructional videos.”

- Seeking assistance from others for performing technological tasks: when needed, one can ask others for help in performing technological tasks and be guided by them.

Code 13: “One way is to go and ask others who know how to help you, so they do it for you. For example,

my father isn’t an illiterate person, but he still wants to transfer money via card-to-card, so he calls me.”

- Engaging in small experiments and practice: undertaking small experiences and practice, as a strategy for urban smartification and the use of technology from the citizen’s point of view, means that by engaging in small experiences and practices related to technology, citizens can become familiar with the concepts and tools of smartification and understand their role in improving the smart city.

Code 9: “There are some citizens who have a lot of good expertise, who can be good advisors to city managers – not only for technology, but some are so creative that they can combine this creativity with the knowledge they have; some other citizens can combine these, provided – and I emphasize this – that we all share the same concern.”

4.3.2. Macro

- Promoting and developing modern citizenship culture

Code 7: “Yes, they play a role. A few days ago there was a bent road sign at the end of our street; I was coming out of the parking lot to see why it was bent, and I saw the asphalt had bulged. I saw it had bulged for no reason – the asphalt had swelled. Then I noticed a water pipe leak, and following the water trail, I saw it had been leaking for days, and the asphalt had swollen because of it. I called the

municipality and the water and sewage company, and they thanked me so much as an exemplary citizen.”

Responsibility: responsibility means commitment and attention to the duties and matters related to urban smartification, which is one of the main factors in the success of this process. When citizens feel responsible for urban smartification, they are more inclined to participate actively in this process; this can improve citizens’ quality of life and advance smart cities.

Demand-making and encouraging participation: demand-making refers to citizens’ expectations and needs from the smart city, and participation refers to citizens’ active involvement in the decision-making and implementation processes of smartification plans.

Information dissemination and advertising: information dissemination and advertising play a very important role in implementing the smart city. This strategy provides citizens and those associated with the smart city with the necessary information and familiarizes them with the benefits and services available in the smart city. This communication can be established through various media such as television, radio, the internet, and social networks. Proper

information dissemination can encourage citizens to use smart services and thereby improve their quality of life.

Education and awareness-raising: Awareness-raising can increase citizens' knowledge of technologies, smart systems, and their benefits. When citizens are familiar with the benefits of urban smartification, the likelihood of better and more productive use of these technologies will increase.

Attention to cultural factors: this factor includes cultural adaptation and reconsideration of traditional culture. Attention to culture is a key strategic factor in the urban smartification process, extracted from the interviews.

- Simplification and usability of systems: by increasing the simplicity and usability of systems, citizens can easily use urban smartification services and facilities and thus benefit from their advantages.

Code 14: "Well, they should design systems to be simple, user-friendly, so anyone with a different level of literacy can work with it comfortably—it should be functional and give a good feeling, not like some websites where you completely get lost."

- Enhancing transparency and building: transparency means honest and reliable information dissemination regarding decisions, performance, and information related to urban issues. This can play an important role in advancing smart cities and increasing citizen participation in the smartification process. Transparency can strengthen citizens' confidence and trust in the urban smartification process and encourage more active, responsible participation, since citizens have clear, accessible information about decisions and actions related to urban smartification and can make the best decisions for their city.

Code 16: "Do you think the data that's given to the government is transparent? Well, it could be, but their operating policies require them to be more transparent with the people – meaning they should be able to gain the people's trust; that's very good."

- Establishing, revising, and publicizing regulations
Code 7: "That poor guy [content] was being spread; from that time, the judiciary issued a directive that distributing such videos is a crime, even punishable by execution – you saw how much it stopped? A lot of extortion had been happening through this."

Establishing laws related to smartification: from the participants' point of view, establishing laws in smartification is a key strategic factor that can directly affect citizens' quality of life and welfare.

Revising laws: revising laws and preventing the enactment of cumbersome regulations on urban smartification is raised by people as an important strategy to protect citizens' rights and freedoms. These include the right to privacy, the right to access information, the right to security, and the right to file complaints, all of which can help assure people that their rights are protected. Establishing independent oversight mechanisms, publishing public reports, and creating transparent mechanisms to improve the quality and security of smart systems can also support legal revision.

Disseminating information regarding laws: disseminating information and providing guidance and training regarding laws to the public in the field of urban smartification helps citizens become fully aware of their rights and duties and participate in the process of urban smartification.

- Implementing knowledge management at the city level

Code 13: "If we implement knowledge management at the organizational level, it will lead to a meritocracy where people are placed according to their abilities. This will certainly have an effect at the macro level as well."

Implementing knowledge management in city administration as a strategy to improve performance and increase efficiency can be very important. Knowledge management helps share knowledge and experience among members of an organization and across the city as a whole. This knowledge sharing increases cooperation and coordination among members and, ultimately, among organizations, and facilitates process improvement and better decision-making. Knowledge management increases efficiency and productivity in city administration.

- Creating the groundwork for financing: establishing a domestic and foreign financing base is of great importance as a strategy for the smartification of Tehran. The effects of this strategy and its necessity are as follows.

Code 5: "If we want to become smart, we need dedicated financing for this issue, both domestically and internationally. Investment by the governmental and non-governmental sectors greatly helps accelerate this process."

Domestic financing base: establishing a domestic financing base for the smartification of Tehran means that the city's domestic resources and capital, including the public budget and other financial resources, are optimally managed and directed toward smartification

projects. This approach enables the city to have the capacity for self-sufficiency and sustainability in financing smartification projects.

Foreign financing base: establishing a foreign financing base for the smartification of Tehran means the city has access to financial resources from abroad through foreign investments, loans, and international cooperation. This approach can help the city secure the financial resources needed for smartification projects and also facilitate the exchange of international knowledge and experience in the field of urban smartification.

4.4. Intervening conditions: refer to factors that can influence strategies. These can include policies, laws, or even sudden events that affect how the phenomenon is realized. As indicated below, intervening conditions are divided into eight main categories, each of which has further subcategories.

- Personal negative experiences of use and rapid, continuous technological changes: continuous and rapid changes in technology and an individual's use of it can have significant negative effects on a person's life and social relationships. Technology has created more and easier connections among people, but it can also lead to separation and increased distance between people, anxiety, and dependence on mobile phones and digital devices.

Code 17: "Sometimes, along this very path, a person has bad experiences that prevent them from wanting to use it again; for example, the scams we've all heard about or experienced."

- Individual characteristics of citizens

Code 5: "Look, people are using some things but don't necessarily know which field they're playing on. It's like a sports field – there's a complex where kids go into a park field to play; one plays basketball with a ball, one plays football, one plays volleyball. But if people know that this is a football field and they must play by football's rules, they would never come in here with a volleyball."

The extent to which laws are observed by the public: by observing urban rules and regulations, people help cooperate with the city's managers and smart systems. This cooperation can improve the performance of smart urban systems and produce the best outcome for everyone.

The degree of public responsibility: public responsibility in implementing the smart city can help develop an active and participatory civic culture. By fulfilling their

duties and responsibilities, people can become active and responsible citizens and participate in urban decision-making and activities.

The degree of ethical conduct among the public: ethical conduct among the public can help preserve the cleanliness and beauty of the city. By observing ethical conduct, people help by not littering in public places, preserving order and the beauty of urban spaces, and protecting natural resources. But if this decreases, it can affect people's feelings and their experience of the smartification process.

Resistance to change among the public: some people may avoid using new tools because they resist change or are unfamiliar with the technology. This reluctance can stem from fear of abandoning old methods, distrust of new technologies, or a lack of understanding regarding the benefits and applications of these tools. Some people may refrain from using new tools in the implementation of the smart city because of security concerns. This may stem from concerns about privacy protection, the possibility of unauthorized access to personal information, or security threats related to using new tools.

- Increased cultural heterogeneity

Code 8: "If your work is online, and sometimes being online creates certain obligations for you toward different people who may have different cultures, this creates certain expectations that could create misunderstanding if you're not online."

Cultural differences: different viewpoints and cultures may increase cultural differences. These differences can lead to conflicts and inconsistencies in using technological tools in urban smartification.

Lack of compatibility with local culture: using technological tools in urban smartification may conflict with local culture and people's sacred values. This can lead to resistance and non-acceptance of technological tools by some individuals.

Inequality in access: different cultures and viewpoints can cause inequality in access to technological tools. People with different cultures and viewpoints may use smart city facilities differently, which can lead to inequality in access to urban services and facilities.

- Hacking of systems and data leakage/disclosure: hacking and data leakage, as an intervening factor in people's feelings toward smartification, have a very negative effect. This can reduce citizens' trust in smart systems and increase fear of their personal information disclosure. This issue can reduce citizen participation in using smart technologies and related activities.

Code 15: "Every day you hear that some organization's system has had its information leaked, hacked – people's information, no one knows whose hands it ends up in."

- The neglect of citizens' needs and expectations: lack of attention to citizens' needs and expectations, as an intervening factor in smartification strategies, means that in the process of decision-making and implementing urban smartification projects, citizens' needs and expectations are not properly taken into account. This can lead to citizens' non-acceptance of and distrust in urban smartification measures, and cause inefficiency and neglect of citizens' fundamental issues. This lack of attention can increase incompatibility and mismatch between smartification strategies and the real needs and expectations of urban society, which ultimately decreases the effectiveness and sustainability of urban smartification projects.

Code 19: "If those managers don't pay attention to people's needs and demands, well, people won't trust or cooperate either – that expectation must be mutual."

- Weakness of hardware infrastructure: this includes weakness and lack of development of infrastructure in the field of communication infrastructure, and weakness in IT knowledge. Weak infrastructure refers to old, worn-out infrastructure and the weak internet infrastructure in the country. Stable, high-speed internet is a fundamental necessity in the age of information and communication, and nearly all young people and citizens need internet access to obtain services and educational resources to improve their living conditions as much as possible. Nevertheless, our country's internet infrastructure is relatively weak compared to other countries. Poor connections, frequent disconnections, and fluctuations in signal strength limit access to stable, high-speed internet.

Code 5: "Sometimes we have it, sometimes we don't; sometimes the services are disrupted, whatever – now, whether we have a [proper] internet infrastructure, or a national one, that's another story, but overall we're quite far behind."

- Inefficiency of the urban management system
Code 2: "They couldn't get anyone to respond – the same pedestrian bridge in Farahzad was broken, and they wouldn't come to fix it, because solving people's problems isn't their concern."

Low concern and responsibility among managers in solving urban problems: low concern among managers

in solving city problems can deprive people of fully benefiting from smartification facilities. This can create inequality in access to urban services and facilities and limit people's ability to benefit from smartification facilities.

Concentration of amenities in the city of Tehran: concentrating resources in a large city can imbalance development of other cities and regions. This can create economic and social differences between large cities and rural areas or small towns, and deprive people in other regions of fully benefiting from smartification facilities. Additionally, concentrating resources in a large city can increase population density in these areas, which can increase problems such as traffic, reduce quality of life, and reduce green space in large cities, and in the long term create inequality of opportunities.

Managers' low attention to ethical conduct: as an intervening factor, this can lead to violations of citizens' rights, decreased public trust, and dissatisfaction with municipal services among citizens. For instance, unfair use of citizens' personal data, non-observance of privacy, and disrespect for citizens' rights can create dissatisfaction and concern, and reduce public trust in smart systems and city managers.

Inappropriate response to existing issues: inappropriate response to existing issues, as an intervening factor in smartification, means solutions that are inefficient, unjust, or incorrect. These responses may include sanctions, harsh and burdensome laws without regard to circumstances and training, or programs dependent on racial or gender discrimination.

Preference for foreign over domestic applications (lack of oversight over some apps and cybercrime): One reason for this lower level of trust may be related to the quality of domestic software. In many cases, software developed by government organizations faces performance problems and deployment failures. Lack of continuity in government planning and oversight: this can stem from insufficient knowledge at the level of city management, lack of institutional accountability, the multiplicity of government decisions across various fields, disorder and lack of coordination in national management, and lack of will and continuity toward smartification.

Lack of meritocracy: from the participants' perspective, a lack of meritocracy leads to a sense of insecurity and hopelessness; institutions and organizations, due to corruption and inefficiency, fail to provide fair and equal services to all members of society. In addition, a

lack of meritocracy can increase inequality and social conflict.

Weak use of talented individuals and citizens' creativity: neglecting citizens' creativity can decline their innovative potential and ideas for enhancing and developing the smart city. This oversight may lead to missed opportunities for improvement and innovation across various urban sectors.

- Economic problems and lack of investment resources: from the participants' point of view, the economic structure of society currently faces numerous, very visible problems. One major problem is the imbalance in the distribution of resources and wealth. In current society, some groups have abundant access to resources and experience greater progress and prosperity, while other segments live in poverty and lack basic life resources. This inequality in resource distribution creates dissatisfaction and insecurity in the disadvantaged and unstable segments of society.

Code 3: "This issue doesn't have much history in the world; this might make it difficult for investors to invest in it, because they don't exactly know what the future looks like, whether there's a return for them."

Large-scale investment: implementing a smart city requires large-scale investment, which may be unaffordable for some cities and organizations. The large amount of capital required can discourage investors from investing in this field.

Uncertainty regarding return on investment: some investors may be concerned about the return on their investment and may refrain from investing in smart city projects. This may be due to the absence of a viable business model, uncertainty about continuous revenue generation, or uncertainty about the success of smart city projects.

Unfavorable economic conditions and lack of financial resources: some cities and organizations may fail to invest in smart city projects due to insufficient financial resources and unfavorable economic conditions. This may be due to budget constraints, lack of financial facilities, or politicians' unwillingness to invest in this field.

Lack of awareness and insufficient information among investors: some investors may refrain from investing in this field due to a lack of awareness and insufficient information about the benefits and opportunities of investing in smart cities.

4.5. Contextual conditions: this refers to the environment or context in which the phenomenon occurs. These factors can include time, place, cul-

ture, and other socio-economic conditions that affect the phenomenon. As shown below, contextual conditions are divided into five main categories, each with further subcategories.

- Distrust

Code 8: "For example, I had an online shoe purchase, and despite the assurance I'd been given, first of all, my shoe size had a problem, and there was no possibility of exchange, so that pair of shoes remained unused, and unfortunately there was no one around me who could use it."

General distrust: general distrust is a feeling of uncertainty and lack of trust in others, organizations, or social systems, which can be introduced as a contextual factor and an obstacle to smartification.

Distrust of domestic apps: distrust of domestic applications can be an important obstacle to smartification. Domestic applications are usually developed for use within a specific organization or company and may not meet users' broad needs. These applications usually have limitations such as insufficient security, unstable performance, incompatibility with other systems, and inability to provide extensive services to users.

Distrust of structure and system: distrust in the existing structure and systems can pose a significant barrier to smartification. The structure and systems of an organization or company encompass the processes, technologies, personnel, and organizational framework used to perform various activities. If these structures and systems are not designed or implemented to support smartification initiatives, they can hinder progress toward achieving smartification.

- Cultural poverty and lack of awareness: the lack of adequate training on the use of technology means that many people are unable to take advantage of all its capabilities. Limited awareness of how to use mobile phones, work with computers, and use the internet can hinder individual and social activities development.

Code 2: "Yes, they run into problems. For example, I often saw my mother going to the Social Security office – my mother and my aunts are literate – so they'd go to Social Security to follow up on their legal matters. But we saw elderly men who have no internet literacy at all, who don't even know [how to use] a smartphone; they say they don't have it, and then they run into problems."

- Cultural backwardness: from the participants' point of view, culture and structure lag behind technology,

as one of the intervening conditions in their sense of fear toward the discussion of smartification refers to the fact that in our society, despite the entry of technology into daily life, smartification has still not fully occurred, and technology has generally not been designed to be reversible or usable for all citizens. This lagging culture and structure usually results from several factors, including some people's lack of access to technology, insufficient training and awareness about using technology, structural resistance and dealings from certain institutions, and even cultural resistance specifically.

Code 3: "At some point it's no longer municipal law, sorry, sorry – it's jungle law. Unconsciously it becomes the law of the jungle, where those who have fallen behind must remain behind – meaning these become the technology brakes."

- Individual-oriented citizen participation and cooperation: individual-centered citizen participation and cooperation, as a basis for implementing urban smartification strategies, allows citizens to actively participate in the decision-making and implementation processes of urban smartification projects. This action not only increases interaction and communication between citizens and officials, but also positively affects decision-making and implementation processes in various urban areas. Individual-centered citizen participation and cooperation in the urban smartification process means citizens spontaneously and voluntarily share ideas, opinions, and needs to improve the city and public services. This type of participation introduces citizens as active partners and an essential part of the urban decision-making process. It can also create a hopeful experience for citizens, since feeling they have a role and can improve urban conditions and their quality of life strengthens self-confidence, hope for the future, and a sense of responsibility and closer connection with their living environment.

Code 19: "Part of it is that the city manager should plan for citizen participation to exist, but whether I have the motivation, or even know how, or want to cooperate and actively participate, matters too."

- Good and integrated governance: governance means the methods and processes used to manage and administer a society, city, or country. Governance usually includes legal, political, economic, and social processes for decision-making and implementation in a society. Good, integrated governance in the smart city means having a management system that ensures that all organs and ecosystems related to

smart city development operate in a coordinated and aligned manner.

Code 16: "Look, governance and how the city is run matter; the more transparent this governance is, the more it creates a basis for public participation, the more coordinated it operates, the more flexible it is, well, the more effective it is."

4.6. Consequences: consequences are the results or outcomes arising from the core phenomenon and the interaction among causal, contextual, and intervening conditions and strategies. They are divided into two categories, positive and negative, each with further subcategories.

4.6.1. Negative

- Increased sense of hopelessness/indifference and distrust: the research participants currently raised concerns about urban smartification, and these concerns create a sense of ambiguity toward smartification in them. One of these concerns is a lack of privacy protection. Citizens fear that, with the expansion of smart systems in the city, their privacy will be violated and their personal information will fall into the hands of other individuals or organizations. In addition, citizens are concerned that, with the smartification of the city, greater control over their lives will fall into others' hands. Some people worry that, through smart technology, all their movements and steps in the city will be tracked and their private life will be brought under control. This creates hopelessness and distrust among citizens. Some people are aware that these systems are still in their early stages and have poor performance, and this has caused discomfort among citizens, heightening their concerns about the efficiency and effectiveness of these systems; if their strategies are not accompanied by transparency and trust-building, they will develop a sense of hopelessness toward this process.

Code 1: "Technology is inherently good, but whether people trust this technology – for example, the apps you mentioned, the permissions on the phone, Snapp is a very useful app, but with the incidents that have happened recently, trust has been lost—CCTV cameras."

- Increased isolation and individualism: If a sense of ambiguity and an uncertain situation exist toward smartification, and this causes fear and concern among citizens, it may lead to isolation and individualism among them. Isolation and individualism may reduce social interaction and increase loneliness, stress, and anxiety among

individuals.

Code 15: "One issue that exists is that, since I don't know what will happen to the future of technology, and on the other hand, I now see that everything is overshadowed by it, well, this has caused people to become distant from one another, and each person thinks only of themselves."

- Excessive dependence of persons with disabilities on others: excessive dependence of vulnerable individuals on others means excessive reliance on the help and support of others. If everything becomes smart and more advanced technologies are used, elderly, disabled, or illiterate people may not be able to fully benefit from these technologies. This situation can increase these individuals' excessive dependence on others, since they will need others' help and guidance to use smart services. This can intensify feelings of incapacity, lack of independence, and reduced self-confidence in these individuals.

Code 13: "For example, the point was that my father is an elderly person who, until yesterday, would go and pay his bill at the bank, but today he has to pay it with a smartphone. Now if he can't, he always has to wait for someone to do it for him – well, he gets disheartened, always becomes dependent."

- Loss of new individual opportunities: loss of new opportunities was raised by participants as one of the negative consequences, in the sense that they believe that if they cannot keep themselves up to date with current technology and the concepts of smartification, they may not benefit from certain new opportunities in various fields of work, personal life, etc.

Code 14: "When you can't keep up with this technology and fall behind, you lose a lot of personal or even job opportunities."

- Concerns about the excessive dependence of the country's structures on technology: if the country's structures are completely dependent on technology, in the event of technical problems or system failures, the performance of structures and public services may be affected, leading to serious problems in society.

Code 15: "Imagine everything goes into the format of the internet and technology; if something happens, everything suddenly collapses, because it's as if everything is connected like a chain – if this hasn't been thought through, it could cause irreparable damage."

- The disappearance of traditions: traditions are part of the cultural identity of a society. With the erosion

of traditions as a result of smartification, part of individuals' cultural identity and social life may be at risk. This can lead to the loss of social connection and cultural values. Traditions usually strengthen human relationships and create unity and solidarity.

Code 16: "I think technology might destroy some of our authentic traditions and cause them to be forgotten."

4.6.2. Positive

- Increased self-confidence and satisfaction: from the participants' point of view, if smartification occurs and its negative causes can be controlled and their desired strategies implemented, their confidence and self-esteem increase, since by using these technologies, people can experience improvement in various matters and enter new activities more easily and with greater confidence.

Code 11: "When those fears about technology go away, and you become hopeful about it and cooperate with it and can do it, your self-confidence increases, and your satisfaction increases too."

- Increased active participation: this means that citizens, confident that their needs and expectations are being taken into account and actions are being taken to improve urban conditions, participate more actively in the smartification process. With increased active citizen participation, the opportunity to present constructive ideas, opinions, and suggestions for improving the city increases. This improves the quality of decision-making and implementation of smartification projects, and increases citizens' satisfaction with and trust in urban processes.

Code 19: "There should be participation, but people shouldn't [just] talk – meaning we should select from among them those who have a distinctive approach, are decision-makers, are respected elders – meaning those who have experience should be selected."

- Increased sense of responsibility and ethical orientation: when citizens feel that they have an important role in improving urban conditions and their decisions have an impact, they develop a greater sense of responsibility to participate in smartification processes. With increased responsibility and ethical conduct, citizens, as active partners in the smartification process, demonstrate improved levels of participation and cooperation.

Code 14: "If people go along with this wave and are involved as an important potential and lever, it makes people feel a greater sense of responsibility, and if we build the culture and educate properly, people's ethics will improve, and they'll act more ethically."

- Increased individual productivity: when citizens are confident that their decisions and actions are effective and lead to the ultimate goal of improving urban conditions, their personal productivity increases; even increased individual productivity in the process of urban smartification has a significant effect on the individual, in the sense that a person feels that their participation and efforts in improving urban conditions are effective, gaining a sense of success and worth.

Code 17: "Well, one of the good effects is that every individual has better productivity, because more capacity has been added to them; this is good both for them and for society, and consequently makes the city better, and it's this smartification and technology that creates this path."

- Increased sense of belonging to Tehran: when citizens are confident that their involvement and participation in the urban smartification process leads to positive and considerable results, they will experience a deeper sense of belonging and connection to their city. This sense of belonging can increase motivation for more active participation in urban affairs and preserving the city's order and beauty. On the other hand, this deeper connection with the city can strengthen commitment and loyalty to the local community, and increase urban identity and stronger human connection among individuals.

Code 11: "If these facilities become more numerous and better, a person develops a greater sense of belonging to their city; this makes them feel a sense of responsibility toward it, and if people think and act this way, the city becomes a better place."

- Increased sense of security: when citizens feel that the process of urban smartification brings considerable improvement to infrastructure and urban services and will lead to visible results, their trust in the actions of the municipality and related bodies increases. This sense of security can be strengthened through improved communication between citizens and executive centers and raising their level of information about urban activities.

Code 13: "As this technology increases, as the city becomes smarter, as all systems get connected, as these tools are used, people's sense of security also increases."

- Contributing to the preservation and maintenance of the environment: among the consequences of smartification is a reduction in environmental pollution. With the creation of smart cities, optimal use of natural resources becomes possible, and

resources are utilized at their true scale. This can lead to reduced energy consumption and the pollution it creates. In smart cities, traffic management systems, urban fabric, and waste production are designed intelligently. These systems, using sensors and machine data, provide optimal performance for managing traffic flow, reducing travel time, and reducing air pollution.

Code 7: "From this perspective, we don't get bank paper; paper consumption has decreased, because part of our administrative work is paperwork; at least part of this paperwork, these apps and online tasks have caused it to decrease. But how much it affects electricity consumption [is another matter]."

- Reduced use of private vehicles: reduced use of personal vehicles is one of the positive consequences of smartification mentioned by the research participants. By reducing car use and choosing public transportation and ride options such as trains or buses, people achieve two main benefits. First, air pollution in cities decreases. With fewer cars on the streets, air pollution and harmful particles also decrease. This improves the city's air quality and brings better productivity and health for residents. Second, urban traffic decreases. Using public transportation and choosing appropriate vehicles reduces the number of cars moving on the streets.

Code 1: "Citizens' use of public transportation – metro and bus – is booming; I generally say people should use it more, less pollution from single-occupant cars. A single occupant can use Snapp [instead]."

- Convergence of urban information: convergence of information, from people's point of view, includes the integration of information, direct communication between people and officials, prevention of duplicate efforts, and the convergence of decentralized data. Urban smartification, by creating connected and integrated systems, enables the sharing of and easy access to urban information. This can help improve urban planning, increase efficiency and productivity, and provide better services to citizens. Urban smartification enables direct communication between citizens and officials. This can lead to increased transparency, understanding of citizens' needs and problems, and providing quick and effective responses from officials. Urban smartification can prevent duplicate efforts and activities by creating convergent, integrated systems. This can improve efficiency and productivity in providing urban services and using resources

optimally.

Code 10: “The good thing now is that they can unify information—if they create this properly and, in an integrated way, gather even decentralized data and use it, this really helps officials in decision-making too.”

- Creation of new job opportunities: one of the positive consequences of this process is the creation of new jobs in society. With the development and establishment of smart systems such as communication networks, sensors, and new technologies, the need for technical capabilities and specific skills in society increases. For this reason, citizens who master these technologies and are able to use them can be employed directly or indirectly in relevant industries. As new jobs are created through smartification, unemployment decreases, and the city and country economy flourishes. Through this

process, unemployed individuals can achieve stable and sustainable employment and benefit from its economic and social advantages.

Code 6: “For example, Digikala has had a positive impact on home-based businesses and enabled them to have an accessible sales market without incurring high costs for them, but for example, grocery stores are no longer needed, or supermarkets have weakened, their sales [have dropped] because you can order anything from Digikala.”

4.7. The paradigm model

Figure 1 presents the hierarchy of relationships among the main categories and subcategories in urban smartification as a paradigm model, each explained in the previous section.

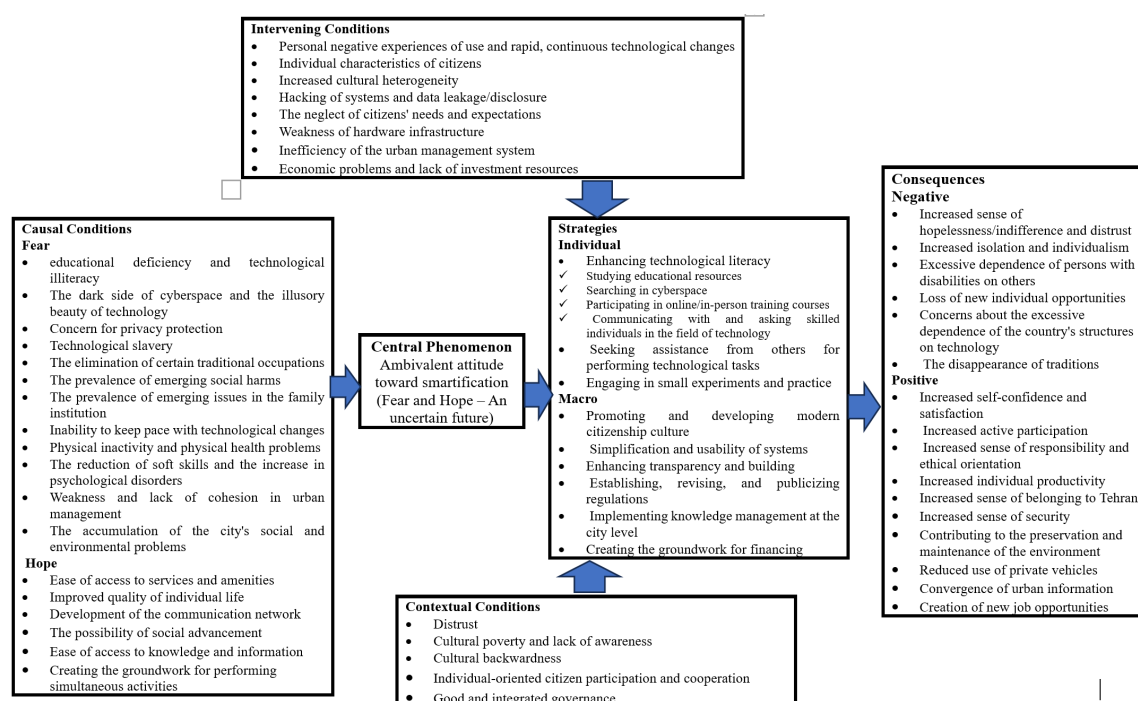


Figure 1. Paradigm model

5. Discussion and interpretation of data

The process analysis of the data shows that citizens' experience of the smartification of Tehran does not take shape as a linear and definitive state, but rather results from their encounter with a set of conflicting factors. The core phenomenon of the research, namely “ambiguity of the situation toward smartification,” refers to a state in which the citizen cannot clearly assess the future of smartification and its consequences, since they simultaneously observe

signs of improved quality of life, ease of services, and social progress, while also facing concerns about privacy, technological dependence, job elimination, distrust, and the inefficiency of urban management. Therefore, fear and hope in this research are not themselves the core phenomenon but rather two perceptual and emotional forms of an experience that arise from the interaction of various factors and create situational ambiguity for citizens. In revisiting the model, it is necessary to distinguish between “the

causes shaping the ambiguity” and “the perceptual content of the ambiguity.” At the first level, what the data express as fear and hope are the participants’ feelings or perceptions. But at the analytical level, these feelings refer to specific factors and experiences. For example, fear of privacy violation is related to the citizen’s ambiguous experience regarding how data is collected and used, weak transparency, and the absence of oversight mechanisms; concern about job elimination is related to economic instability and the inability of the management system to prepare the workforce; and hope for ease of services arises from the experience of using online payment, non-in-person services, and faster access to information. Therefore, in the final interpretation, “fear” and “hope” do not remain as independent causal conditions but are understood as two perceptual consequences of the causal and contextual conditions. The actual causal conditions consist of objective experiences and mechanisms such as weak education and information dissemination, the experience of system inefficiency, concern about data security, the spread of dependence on technology, rapid changes in the labor market, the persistence of urban problems, and the observation of benefits such as reduced cost, time savings, and increased access to services. Through citizens’ interpretations, these factors lead to fear or hope and ultimately create or intensify the phenomenon of situational ambiguity.

The process begins when citizens encounter technology and smart services, but this encounter does not occur in a vacuum. The Tehran citizen experiences technology within a context accompanied by traffic, pollution, population density, social inequality, general distrust, weak education, and previous experiences with the performance of urban institutions. These elements constitute the contextual conditions of the research; that is, the environment in which the meaning and effect of causal factors take shape. For instance, a new system in a society with high public trust might be perceived as a sign of efficiency, but the same system, in a context of general distrust and previous unsuccessful experiences, can increase concern about control, surveillance, or misuse of information. Therefore, distrust, cultural poverty, and cultural lag are selected in the model as contextual conditions, not because they directly create the phenomenon like a technical factor, but because they shape the context of citizens’ interpretation and reception of smartification. In this sense, contextual conditions answer the question of “in what social and

cultural environment” the phenomenon occurs.

In contrast, intervening conditions refer to factors that strengthen, weaken, or divert the relationship among causal conditions, the phenomenon, and strategies. Weak communication infrastructure, economic problems, system hacking, institutional lack of coordination, inefficiency of urban management, discontinuity of programs, and neglect of citizens’ needs are not merely the general context of the phenomenon’s occurrence; rather, they determine how citizens can respond to their ambiguity and the extent to which proposed strategies can be realized. For example, citizen education can reduce ambiguity only when stable internet, usable systems, and responsive management exist. Otherwise, education may increase citizens’ awareness, but the executive structure’s failure to provide appropriate service may further increase their distrust. For this reason, although contextual and intervening conditions overlap in some data, they differ in their analytical role: contextual conditions provide the social and cultural context of the experience, while intervening conditions moderate the intensity and pathway of transforming this experience into action and consequence. Accordingly, strategies should not be placed alongside economic problems, weak infrastructure, or management inefficiency as categories of the same level. Economic problems and management inefficiency are constraints and intervening conditions, whereas improving technological literacy, asking for help, individual practice, public education, simplifying systems, increasing transparency, legislation, knowledge management, and financing are actions and responses employed to manage the phenomenon. Therefore, the analytical priority in the model is as follows: first, causal conditions and objective experiences shape citizens’ ambiguity; then, this experience acquires meaning within a specific cultural, social, and institutional context; intervening conditions determine the possibility of or constraints on responding to it; and finally, actors adopt individual or macro-level strategies based on this situation. In other words, a citizen who faces difficulty with a system, privacy concern, or unfamiliarity with technology may turn to learning, practicing, and seeking help. But if they face internet outages, system instability, lack of accountability, and institutional distrust, they may choose the strategy of avoidance, minimal use, or a return to traditional methods.

In this process, individual and macro-level strategies

also have a complementary and reciprocal relationship. Individual strategies such as learning, practicing, and seeking help can increase citizens' ability to use technology, but alone they cannot remove structural obstacles. In contrast, macro-level strategies such as transparency, public education, legal data protection, organizational coordination, and financing provide the necessary conditions for individual strategies' effectiveness. If systems are complex and unstable, responsibility for adaptation cannot be placed solely on the citizen. Therefore, the findings show that ambiguity toward smartification is not solely due to individual unawareness, but arises from the gap between citizens' ability and readiness on the one hand, and the capacity and performance of urban institutions, on the other. The model's consequences are also directly influenced by the type of strategies adopted and the conditions under which they are implemented. If ambiguity is addressed through education, transparency, participation, privacy protection, integrated management, and usable systems, fear can transform into conditional trust, active participation, increased responsibility, improved productivity, a strengthened sense of belonging to Tehran, environmental improvement, and the creation of new job opportunities. But if intervening conditions intensify and effective strategies do not take shape, the same ambiguity will lead to hopelessness, distrust, isolation, dependence of vulnerable individuals, loss of opportunities, and concern about the dependence of the country's structures on technology. Therefore, consequences are not predetermined but arise from the interaction among causal, contextual, and intervening conditions and the quality of individual and macro-level strategies. As a result, the theory emerging from the data can be formulated as follows: The more smartification proceeds within a context of weak education, distrust, institutional lack of coordination, weak infrastructure, and disregard for citizens' real needs, the greater the gap between technological promises and people's everyday experience, and the more this reinforces the ambiguity of the situation, fear, and conditional acceptance; but the more this gap is reduced through education, transparency, participation, legislation, integrated management, and attention to social differences, the more citizens' hope shifts from the level of subjective expectation to actual trust and practical participation. Accordingly, the core category "ambiguity of the situation toward smartification" links citizens' objective experiences, Tehran's socio-institutional

context, individual and managerial responses, and the final consequences of smartification, rather than a simple repetition of causal conditions.

6. Conclusion and recommendations

The present study aimed to understand the lived experiences of Tehran citizens regarding their perceptions of the smart city, with an emphasis on social and economic dimensions. The main research question was how Tehran citizens experience and make sense of the smartification of the city. Based on interviews with 19 Tehran citizens, the study found that citizens' experience of smartification is not uniform or definitive; rather, they perceive the smart city simultaneously as an opportunity to improve their lives and as a phenomenon accompanied by concern and ambiguity. Therefore, the core category of the research, titled "ambiguity of the situation toward smartification," was identified. This category shows that citizens are neither fully in favor of smartification nor completely reject it; rather, their acceptance depends on the manner of implementation, the level of trust, the quality of services, and its social and economic consequences.

In response to the positive dimensions of smartification, participants pointed to ease of access to services, reduced time and cost, easier use of banking, educational, medical, and municipal services, improved communication, quick access to information, increased security, facilitated transportation, and improved quality of life. From their point of view, smartification can improve urban management and reduce traffic and pollution by reducing in-person visits and unnecessary trips. Furthermore, technological development can create new job opportunities, expand modern businesses, and increase citizen participation in urban affairs.

Concerning the challenges and negative consequences, the results showed that citizens' most important concern is weak trust in the smartification process. Concerns about privacy protection, security and information leakage, lack of transparency, weak education, the complexity of some systems, inequality in access, dependence on technology, the possibility of eliminating traditional jobs, and the inability of the elderly, people with disabilities, and people with low literacy to use smart services constitute the most important aspects of citizens' fear. Additionally, the spread of cyberspace addiction, reduced social interactions, increased individualism, and the weakening of some family relationships were among

the other consequences that participants warned about. The research findings, in response to the question regarding the factors affecting citizens' experience, showed that this experience does not depend solely on the extent of individuals' access to mobile phones or the internet. The quality of urban management, the extent of information dissemination, system performance, economic conditions, communication infrastructure, general culture, the level of social trust, and the attention of responsible institutions to citizens' real needs all play a role in shaping this experience. For this reason, a smart service may be, for some citizens, a sign of welfare and ease, while for another group, due to complexity, cost, or lack of proper access, it may be perceived as a sign of deprivation and dependence.

In response to the question regarding strategies for confronting smartification, participants emphasized both the individual and institutional levels. At the individual level, increasing digital literacy, gradual learning, practice, and using the help of others were the citizens' main strategies. At the institutional level, simplifying systems, public education, increasing transparency, protecting personal data, involving citizens in decision-making, improving infrastructure, coordination among organizations, and attention to disadvantaged groups were considered necessary. Therefore, the results show that responsibility for adapting to the smart city should not be placed solely on citizens; urban institutions must also provide the conditions for fair and reliable use of technology.

Overall, the research's final answer to the main question is that Tehran citizens experience the smart city as a hopeful but uncertain phenomenon. They have observed the benefits of technology in their daily lives, but due to weak trust, ambiguity about the future, unequal access, security concerns, and managerial shortcomings, their acceptance of smartification is conditional. Accordingly, from citizens' point of view, the smart city will be desirable when it helps solve the city's real problems, provides simple and accessible services, protects individuals' rights and privacy, and does not create discrimination among different social groups.

This research contributes to smart city studies by providing a picture of this phenomenon from the perspective of Tehran citizens' experience and understanding. The findings show that the evaluation of the smart city should not be based solely on the number of systems, the extent of infrastructure development, or the volume of digital services, but

should also take into account trust, satisfaction, a sense of security, equity of access, and the extent to which technology affects citizens' real lives. As a result, successful smartification for Tehran is not merely digitizing services, but creating a human-centered, transparent, participatory process appropriate to citizens' social and economic conditions.

The following recommendations were derived directly and practically from the categories, selective codes, and relationships extracted in the paradigm model of the research:

Reducing citizens' ambiguity and distrust: in light of the categories of "public distrust," "privacy concerns," "hacking of systems," and "enhancing transparency and building trust," urban management should, for every smart system, explicitly declare what data are collected from citizens, which organizations are granted access to this information, for what purpose the data are used, and how long they are retained; it should also clarify how citizens can access their own data or request its correction and deletion. In addition, periodic reports on the systems' security, the extent of data use, and the performance of smart services should be published, and a simple and accessible mechanism should be established for registering complaints and following up on privacy violations.

Targeted promotion of digital literacy: given the codes "educational weakness and technological unawareness," "inability to keep pace with changes," and "seeking assistance from others," citizen education should not be confined to uniform public courses. It is therefore proposed that training programs be designed at three levels: elementary education for the elderly, individuals with low literacy, and citizens unfamiliar with technology; applied education on the use of urban services, online payment, transportation, and governmental systems; and advanced education on information security, privacy protection, and the detection of fake content. These courses can be held in neighborhood houses, cultural centers, metro stations, public libraries, and urban service centers, and for vulnerable groups, in-person training and telephone assistance should also be provided.

Designing simple and universally usable systems: in light of the code "simplification and usability of systems" and the concerns regarding the elderly, persons with disabilities, and individuals with low literacy, urban systems should be tested by various groups of citizens before their public launch. System design should incorporate plain language, legible fonts, voice-based interaction, step-by-step guidance,

accessibility for persons with disabilities, and the possibility of receiving services without requiring specialized skills. Moreover, until all citizens can use digital services independently, in-person and telephone service channels should not be entirely removed.

Reducing inequality in access to infrastructure: in light of the codes “weakness of communication infrastructure,” “inequality in access,” and “the deprivation of persons with disabilities,” the development of smart services should be accompanied by identifying underprivileged areas and groups. Establishing public internet access points, equipping neighborhood centers, improving stable internet coverage, and providing certain services free of charge or at low cost can prevent the exacerbation of the digital divide. Furthermore, evaluating smart city projects should not rely solely on the number of users or systems; it should also measure the extent of access among underprivileged groups.

Establishing genuine citizen participation in service design: in light of the categories of “individual-oriented citizen participation,” “demand-making (assertiveness),” and “the neglect of citizens’ needs and expectations,” it is proposed that before the design or development of any smart service, social needs assessment and field testing be conducted with citizens’ involvement. For this purpose, neighborhood-level surveys, focus groups, suggestion-receiving systems, and regular meetings with representatives of the elderly, persons with disabilities, shopkeepers, students, and underprivileged groups can be employed. The outcomes of this participation must tangibly affect the final revision of the systems, and the report should likewise be announced to the citizens.

Strengthening the coordination and accountability of urban management: in light of the codes “weakness and lack of cohesion in urban management,” “inefficiency of the urban management system,” “lack of continuity in planning,” and “weak utilization of elites,” the responsibility for each smart city project, its evaluation indicators, and its implementation timeline should be explicitly and transparently specified. Establishing a coordination mechanism among the municipality, service organizations, technology companies, and related institutions can prevent duplication of efforts and data fragmentation. Additionally, changes in management should not lead to the suspension or repeated alteration of smart city programs; the continuity of programs must be

guaranteed based on executive documents and measurable indicators.

Supporting employment and new skills: in light of citizens’ concerns about “the elimination of certain traditional occupations” and, at the same time, their hope for “the creation of new job opportunities,” smart city development should be accompanied by programs supporting the workforce. Holding retraining courses for occupations subject to change, supporting local digital businesses, establishing innovation centers, and providing tech internships can prevent smartization from turning into a driver of unemployment. Support for start-ups should be linked to the city’s real needs and the capacities of its neighborhoods, rather than limited to general and untargeted assistance.

Preventing emerging social and familial harms: given the codes “addiction to mobile phones and cyberspace,” “the decline of social interactions,” “family disorders,” and “the reduction of soft skills,” smart city programs should be paired with education on responsible technology use. Producing educational content for families, teaching time management in cyberspace use, strengthening children’s and adolescents’ media literacy, and creating in-person cultural and social programs in neighborhoods can help prevent the decline of face-to-face interactions and the rise of social isolation. The objective is not to remove technology from citizens’ lives, but to establish a balance between digital life and real social relationships.

Linking smart development to solving Tehran’s real problems: given the persistence of “traffic,” “pollution,” “congestion,” and “environmental problems” in citizens’ lived experience, smart city projects should be directly tied to the resolution of these issues. The development of integrated transportation systems, the provision of up-to-date information on routes and air quality, coordination between public transportation and non-in-person services, and the use of urban data for traffic management should be evaluated through clear indicators such as reduced travel time, reduced fuel consumption, and improved air quality. Otherwise, from citizens’ perspective, smart development will turn into a collection of systems with no tangible impact on the city’s principal problems.

Simultaneous maintenance of in-person and digital services: given concerns about “excessive dependence of persons with disabilities on others” and “the loss of opportunities,” the complete removal of in-person services is not recommended. Smart services should

be provided alongside in-person and telephone channels and human support, so that the elderly, persons with disabilities, individuals with low literacy, and citizens lacking adequate internet access are not deprived of public services. This approach can prevent smart development from becoming an instrument of social exclusion.

Preserving culture and balancing tradition and innovation: in light of the codes “the disappearance of traditions,” “cultural backwardness,” and “the mismatch with local culture,” the design of smart services should be compatible with Tehran’s cultural and social conditions. Using language and symbols comprehensible to citizens, paying attention to neighborhood-based interaction patterns, and preserving public spaces and in-person cultural activities can prevent a gap between technology and social culture. The smart city should not be a complete substitute for the real city; rather, it should contribute to completing and improving life in the city’s physical space.

Suggestions for future research

Given the qualitative nature of the present study and its focus on Tehran citizens, it is suggested that future studies:

Overall, this research’s recommendations were formulated not based on the general and predetermined benefits of the smart city, but based on the experiences, concerns, hopes, and strategies expressed by the participants. Effective policy-making is not just about introducing new technology, but about alleviating citizens’ confusion through education, transparency, equitable access, meaningful participation, and strong institutional accountability. In conclusion, using a qualitative approach and relying on semi-structured interviews with a limited number of participants, this research does not have statistical generalizability, and its findings mostly reflect the experiences and perceptions of the selected participants regarding urban smartification. Additionally, due to the self-reported nature of the data, there is a risk of response bias, personal experiences influencing answers, and participants providing responses that align with social norms rather than accurately reflecting their true views. The research’s focus on citizens’ perspectives and on issues related to the social and perceptual dimensions of smartification may also have diminished the perspectives of other stakeholders, including city

managers and technology experts. In addition, the findings were formed within the temporal and spatial context of Tehran, and caution should be exercised in generalizing them to other cities and social conditions.

Authors’ Contributions

First author: 50%; second author: 50%.

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Conflict of Interest

The authors of this article have no financial sponsor and no conflict of interest.

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