



Improving the System of Urban Development Plan by Formulating the Mess and Using Soft Systems Methodology

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ABSTRACT

The urban development planning process in Tehran municipality has been implemented for about two decades in the form of compiling four medium-term urban development plans of Tehran. Despite the efforts made, there are challenges to achieving the goals. This research has analyzed the barriers and identified solutions to improve the system of the development plan of Tehran by formulating the mess and using soft systems methodology during a systemic intervention by planning the learning process in practice. The innovative research method is the embedding of mess formulation in soft systems methodology. Formulating the mess analyses the barriers to identifying inefficiencies about aspects of how power, wealth, knowledge, value, and aesthetics are produced and distributed in a social system. Soft systems methodology is an action-research approach for learning human systems in complex problem situations. After a thematic review by referring to the key actors involved in formulating Tehran's urban development plan, first, the problem situation was analyzed, and a rich picture of the problem was drawn. According to formulating the mess, the obstacles were presented and discussed through some sessions in five subsystems of generation and distribution of power, wealth, knowledge, value, and aesthetics. Later, a conceptual model of the ideal system of urban development planning was designed. Then, desirable and executable system changes were identified based on a comparison of the ideal system and the current system, and they were proposed in the form of purposeful activities toward system improvement. Tehran's urban development planning requires a major change in the approach toward planning and solving complex urban problems. This study is an application of systems thinking approaches in learning in practice and managing the complexity of the diversity of views of urban planners in the experience of urban development planning in Tehran.

Keywords

Urban development planning, Soft systems methodology, Formulating the mess, Tehran municipality.

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1. Introduction

Formulation of Tehran's urban development plan based on urban development approaches and through the determination of prospects, missions, core values, macro goals, and selection of a proper planning model is undertaken in expert committees of organizations, companies, and the headquarters of the 22 districts of Tehran Municipality ([Performance Report of the Third Municipal Program of Tehran, 2022a](#)). Four urban development plans have been formulated and executed for Tehran so far. The structure and principles regarding the formulation of the fourth plan are composed of the supreme group, the leading and integrating council, the planning secretariat, expert committees, the scientific committee, and workgroups from the 22 districts, which are entrusted with the task of studying and examining the current status, formulating solutions, determining strategic goals, policies and principles of the plan, enumerating the indices, evaluating, pursuing approvals procedure and documenting the plan ([Tehran's fourth urban development program formulation regulations, 2022b](#)).

This study conducted a problem-oriented systems intervention using SSM by proposing a learning-by-doing procedure and analyzing the obstacles to developing a system for formulating Tehran's urban development planning inspired by formulating the mess by considering the varied viewpoints of the participants in planning formulation.

Formulating the mess analyses the obstacles in identifying dysfunctions in the aspects of how power, knowledge, wealth, aesthetics, and value are generated and distributed in a social system and is based on the following principles: 1. No social system can consume more than it produces in the long run. Wealth distribution without effective production results in poverty (generation and distribution of wealth); 2. Management of social systems requires understanding and consensus about the regulations of decision-making and the why and the reasoning of affairs (generation and distribution of power); 3. The success of any social system ultimately depends on its capability to generate and distribute the knowledge a learning system requires (generation and distribution of knowledge); 4. The effectiveness of an organization depends more on the management of the interactions between its members than on the activities (generation and distribution of values); 5. Effective membership in a social system requires a role, a sense of belonging, and faithfulness to participate in creating the future (generation and distribution of aesthetics) ([Gharajedaghi, 2015](#)). SSM is an action-research approach for learning purposeful human systems in complicated problem situations. This methodology analyses the problem situation from a holistic, systemic approach and fosters group learning from the experience of the participants and those involved in the problem in the form of conceptual models by

proposing a learning-by-doing procedure. It is considered a systems approach and research on soft operations, which entails significant successes in managing the complexity of different viewpoints from the stakeholders involved in the problem (Masys, 2016).

This literature review focused on two lines of studies: urban development planning in Tehran Municipality and the literature on the application of the Soft Systems Methodology.

As for the line of urban development planning in Tehran Municipality, Faizi and Barak pour (2022) evaluated the development plans for the metropolis of Tehran and its suburbs by focusing on the implications of climate change and indicated that Tehran's urban development plans lacked sufficient emphasis on the influences of climate change. Kamanroodi et al. (2021) analyzed the identity and branding orientations in Tehran's urban development plans. Molaei et al. (2018) evaluated the efficiency of participatory management in Tehran's urban development planning and indicated the drawback on the part of participation from non-governmental organizations, the private sector, and the public. Ebrahimi and Abdi Daneshpour (2017) referred to failure in reaching consensus among the policy-making agents about maintaining integrative policy-making principles, negligence or oversight of the mutuality of formal and informal elements as well as the absence of a continuous planning process for decision-making as the most important causes of disintegration in Tehran's policy-making.

In an investigation into the applications of SSM in urban management and planning issues, Shahrabi Farahani et al. (2022) designed an alignment pattern of program and budget in Tehran Municipality. They indicated the lack of association between program and budget in Tehran Municipality under the influence of intra- and inter-organizational root causes such as lack of supporting regulations, weakness in the budgeting system, poor program structure, weakness in the mechanisms of intra- and inter-organizational monitoring on program and budget, financial and accounting weaknesses, infrastructural requirements and lack of coordination between stakeholders. Using SSM, Benz, and Stafacher (2023) analyzed the problem of changing Swiss railroad stations, taking into account the gap between the short-term local worldview and the long-term national worldview. Lin et al. (2022) designed Gwangju's urban economic development model and proposed recommendations for planning the urban development of pioneer industries. Markou (2022) addressed sustainable urban management of flooding threats. Wang and Roon (2021) analyzed urban management strategies for storms. Wang et al. (2021) designed a model for planning suburban identification and its expanding patterns in Harbin, China. Zhang and Chen (2021) explored urban management of water quality under the threat of an unanticipated storm. Qiao et al. (2019) investigated the governance factors involved in

the sustainable management of stormwater and developed a model in consensus from the perspectives of four cities in China and Sweden. [Sarawat et al. \(2017\)](#) modeled the scenario of integrative urban water management for sustainable water governance in the Kathmandu Valley, Nepal.

[Schilder \(2016\)](#) designed the supporting systems of planning in urban development in the Netherlands, and [Romero-Garcia et al. \(2015\)](#) designed a model of a sustainable urban tourism system in Mexico City. [Suriya and Moodgal \(2013\)](#) addressed the integrative management of floods in their studies on catchment basins in Adyar, Chennai, India, using SSM. [Jeppesen \(2011\)](#) explored the open use of the concept of sustainability in transport planning, and [Coelho et al. \(2010\)](#) designed the supporting structure of decision-making in urban energy planning. [Nasiri et al. \(2022\)](#) developed the system of corona disaster management in Tehran Municipality using the mixed approach of SSM and Social Network Analysis (SNA). [Delima Modiroos et al. \(2020\)](#) analyzed land facility development on the basis of the regional geographical capacity in Brazil. They revealed the complicated requirements, the ambiguous relations, the conflicts of interest, and the integrated solutions of the involved institutions. [Nguyen et al. \(2019\)](#) designed a framework with the purpose of using SSM that revealed the local community's understanding in order to mend the ecology based on different viewpoints stemming from the main stakeholders' and decision-makers' perceptions using SSM. The review of studies shows the wide application of SSM in the management of stakeholders with diverse views on a wide range of urban problems.

A review of the literature indicated that despite the wide applications of systems methodologies in solving complicated urban problems, the studies in urban development planning are highly limited in Tehran Municipality. Furthermore, despite the emphasis placed on the lack of consensus on urban management development policymaking and the suggested challenges and obstacles, holistic, systemic studies in this regard have not been the focus of attention. Therefore, this study proposed learning in action to conduct a problem-oriented systemic intervention using SSM and, inspired by the formulation of the mess theory; the social system development obstacles were structured under five subsystems of generation and distribution of wealth, power, value, knowledge and aesthetics, and, using the soft systems approach, not only was a model of an ideal system of plan formulation designed but the expandable points of the mid-term plan formulation system in Tehran Municipality were also identified. This study was carried out in Tehran Municipality in 2023.

2. Methodology

The SSM steps include the following: 1&2. Confronting the Problem Situation: This step encompasses entrance into the problem situation and identification of persons, culture, standards, and the values governing the situation through interviews, discussions, brainstorming, and representative illustrations; 3. Developing Root Definitions: Root definitions are the statements that define an ideal system, its goals, and the persons who would be involved in it; 4. Developing a Conceptual Model: A diagram of all the activities and the connecting lines between them is developed; 5. Comparing the Model with the Real World: This step involves comparison of the models with what actually happens in the real world; 6. Identifying and Determining the Required Changes: This step includes systematic determination of the desirable changes that are also culturally practicable in the real world; and 7. Executing: In this step, the changes determined in the previous step are executed in practice (Jackson, 2019). The research data was collected using supporting documents on Tehran city planning, previous critical studies, and group interviews with planners. The research community was identified among the principal elements of Tehran's fourth plan formulation supreme group. Table 1 presents the descriptions of a number of select participants in the research.

Table 1. Descriptions on the research participants selected from the key actors of the supreme group formulating Tehran's fourth plan

No	Education	Expertise	Experience (years)	Specialization
1	PhD.	Public administration	20	Supreme group of planning/Leading and integrating
2	Masters	Environmental Engineering	22	Supreme group of planning/Leading and integrating
3	PhD.	Accounting	17	Resources and consumptions
4	PhD.	Health disasters and emergencies	20	Safety and disaster management
5	PhD.	Economy	4	Finance and urban economy
6	Ph. D.	Political geography	8	Management development
7	Masters	Management	20	Urban services and environment
8	Masters	Information and communications technology	19	Intelligentization and information technology
9	PhD.	Public administration	20	Human capital
10	PhD.	Management	14	Management development

3. Findings

The research findings are explored following the steps of SSM.

3.1. Steps 1&2: Confronting the problem situation

The first two steps explored the problem situation of the system of formulating Tehran's urban development planning based on the documents provided by the supreme group responsible for

formulating Tehran's fourth urban development plan and the actors' actions and minutes and enactments of expert committees' meetings on formulating Tehran's fourth urban plan. In order to determine the boundaries of the study, as shown in Figure 1, the system boundary and the system input and output were determined in agreement with the stakeholders. As observed here, at the level of Tehran's comprehensive planning system, Tehran Municipality, and Tehran's Islamic City Council are responsible for the management of the system. System inputs are taken into consideration based on upstream reference documents, enactments communicated by the Islamic City Council of Tehran, the pyramid of organizational responsibilities of the units involved in the problem in Tehran Municipality, and the organizational resources, facilities, capacities, and capabilities available. The system of interactions between actors is addressed based on the responsibility structures in a supreme group of Tehran's fourth urban development planning and the series of actions taken by the actors in this group. Ultimately, the system output is the formulation of Tehran's fourth urban development plan. The system boundary encompasses a collection of actions and interactions by the actors in the supreme group of Tehran's fourth urban development plan. The formulated plan in the total system of Tehran's urban planning has passed the fourth plan's approval procedure in collaboration with the Program, Budget, and Accounting Commission as well as the other expert commissions in the Islamic City Council of Tehran. This study focused on the viewpoints put forth by those involved in formulating the plan in Tehran's fourth urban development planning supreme group.

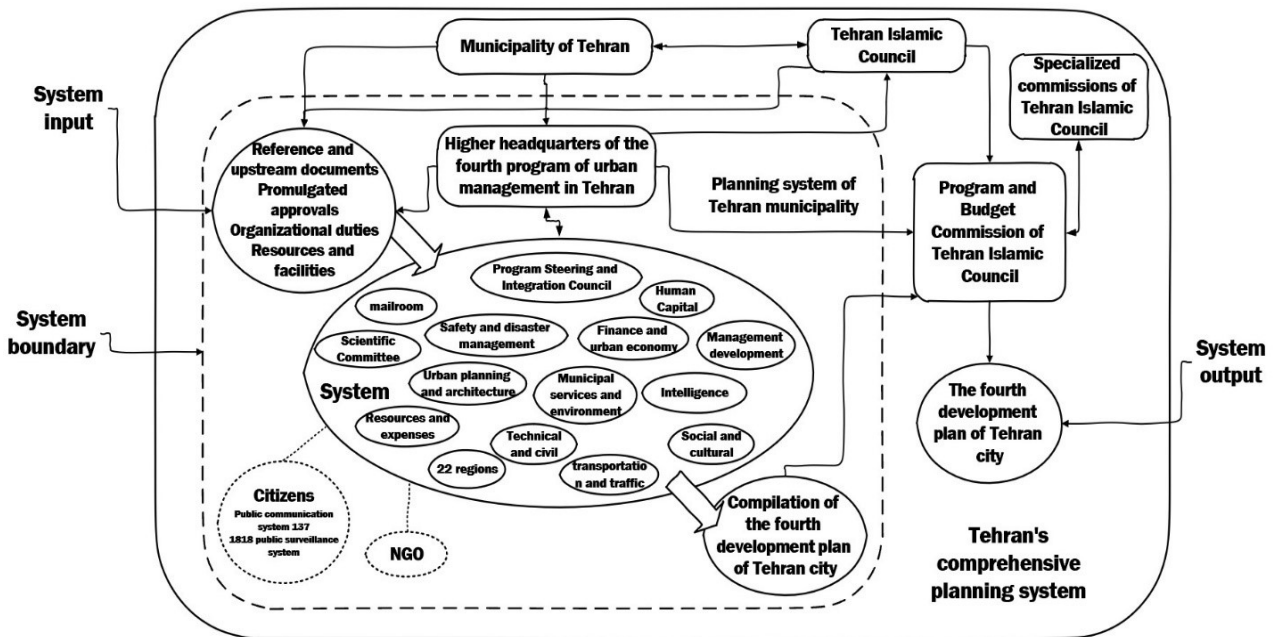


Figure 1. Definitions of the system of formulating Tehran's fourth urban development

Afterward, through interviews and discussions with the fourth plan formulation experts, the problem situation and the current structure of formulating urban development plans in Tehran Municipality were explored. With the help of the intervention team, a rich picture of the situation of the system of formulating Tehran's urban development plans was drawn, and discussions around the problem situation of the system of formulating plans and development areas were formed on that basis. The illustration gave the participants the opportunity to gain insight into the important causes and their relationships from the viewpoint of the other participants and the ground for the creation of a common representation of the system of formulating Tehran's urban development plans could be fostered. Figure 2 indicates the rich picture of the problem of the system that is formulating Tehran's urban development plans.

As shown in the figure, the actors of this system are the Islamic City Council of Tehran and Tehran Municipality as the principal owners of the problem and the actors of the system, the principle elements of plan formulation in line with the structure of the supreme group of Tehran's fourth urban management plan, including the program leading and integrating council, expert committees, resources and consumptions committee, science committee and workgroups of the 22 districts of Tehran Municipality. The clients of the system of formulating Tehran's urban development plans are Tehran's citizens, Tehran Municipality's employees, the public sector, the private sector and non-governmental organizations. The citizens of Tehran, as the victims of inefficiency of Tehran's urban development plan formulation system, are facing an increase in urban problems that urgently need to be addressed.

In this systemic intervention design, Tehran Municipality aims to develop the system of formulating Tehran's urban development plan based on recording lessons learned from the key actors of the supreme group responsible for formulating Tehran's fourth urban development plan so that the grounds for developing planning processes will be fostered in similar planning experiences.

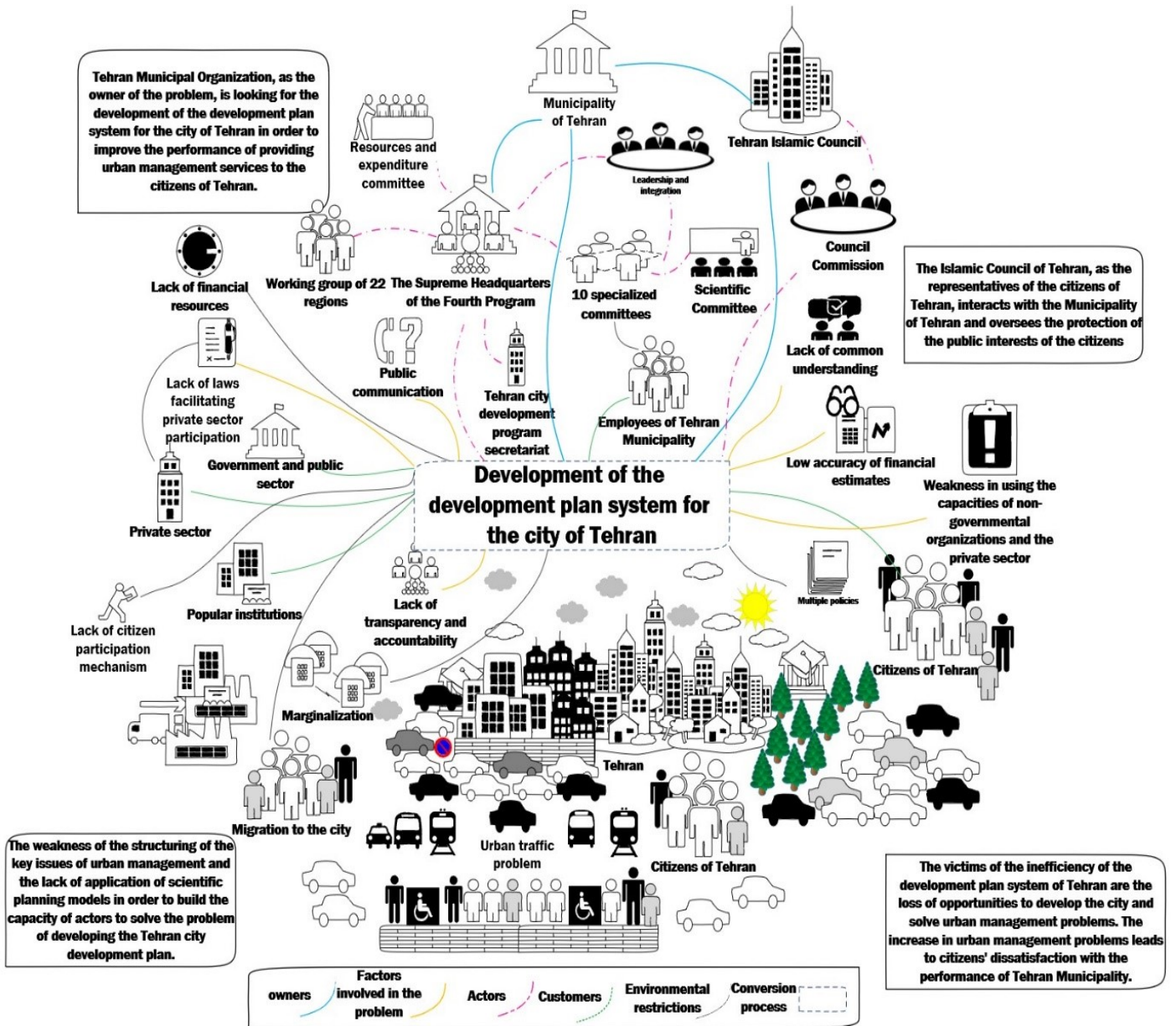


Figure 2. Rich Picture of the problem of Tehran's urban development plan formulation

3.2. Step 3: Developing root definitions

A root definition is a statement describing an ideal system, its objectives, and those involved in it. A technique called CATWOE is applied when developing root definitions. The analysis results are presented in Table 2. Then, using the opinion and consensus from the stakeholders, the problem of developing a system of Tehran's urban development plan formulation was analyzed, and an agreed-upon root definition was developed.

Table 2. CATWOE components of the system of Tehran's urban development plan formulation

CATWOE	System of tehran's urban development plan formulation
Customers	Tehran's citizens, Tehran Municipality employees, executive institutions, Tehran's public sector, Tehran's private sector businesses, Tehran's non-governmental organizations
Actors	Supreme group of formulating Tehran's fourth urban management plan; Tehran's mayor; program leading and integrating council; program secretariat; resources and consumptions committee; scientific committee; specialized committees for formulating programs including the financial and economic committee of the city; human capital committee; management development committee; intelligentization committee; urbanism and architecture committee; safety and crisis management committee; environment and urban services committee; technical and constructional committee; transportation and traffic committee; social and cultural committee; Tehran Municipality workgroups of the 22 districts; representatives of Islamic City Council of Tehran; program, budget and accounting commission of Islamic City Council of Tehran; expert commissions of Islamic City Council of Tehran
Transformation	Development of the system of Tehran's urban development plan formulation
Worldview	The main obstacles in the development of social systems are caused by the malfunctioning of one or all five dimensions of social systems (generation and distribution of wealth, power, value, knowledge, and aesthetics). With regard to the analysis of development obstacles, formulating the mess leads to a new way of looking at the structuring of social system issues and creating system development opportunities.
Owners	Tehran's Islamic City Council and Tehran Municipality
Environmental Limitations	The absence of an integrated governance structure of urban management at the macro level of the country; the rising trend of issues and problems of Tehran city; lack of credits and financial resources available for the urban development plans of Tehran; absence of a suitable mechanism for citizens' participation toward the realization of Tehran's urban development plans; lack of laws facilitating private sector participation; multiple and sometimes contradicting urban management policies in the governmental, public and private sectors of the country

3.2.1 Analysis of obstacles in development of system of tehran's urban development plan formulation

For the ideal system's dimension to be analyzed, first, the obstacles in the development of the system of Tehran's Urban Development Plan Formulation were extracted, taking into account the examination reports of the previous programs and the documents on Tehran's fourth urban development plan formulation. Then, in a semi-structured interview session, the list of the obstacles to Tehran's fourth urban development plan formulation system was presented to the participants, and they were asked to identify the most important obstacles in the Tehran Municipality situation. The identified obstacles were discussed through some meetings, and 37 obstacles agreed upon by all of the participants were determined under five subsystems based on the content analysis of participant opinions. Table 3 presents the obstacles to the development of Tehran's urban development planning formulation system.

Table 3. Obstacles in developing Tehran's urban development plan formulation system

Obstacles in the subsystem of generation and distribution of wealth	Symbol
Shortage of sustainable sources of income for Tehran and limitation of financial resources for Tehran Municipality	W01
Insufficient flexibility in supplying the costs of implementing the program vs. variations in the economic environment of the country and Tehran Municipality	W02
Insufficient conformity of Tehran Municipality's annual budgets with the resources predicted in Tehran's urban development plans	W03
Low accuracy of the financial estimates of the table of resources and consumptions of Tehran's urban development plans	W04
Weakness of Tehran Municipality's budgeting system	W05
Obstacles in the subsystem of generation and distribution of power	Symbol
Weakness in the planning structure and lack of integration in the institution responsible for planning and managing Tehran's urban development	P01
Uncertainty, lack of understanding, and collective agreement on the decision-making criteria of the principles of formulating Tehran's urban development plan	P02
Unclear mechanisms of approval, control, surveillance, and implementation in a number of provisions of Tehran's urban development plan	P03
Inadequate stability of urban management and change of program priorities during the implementation of Tehran's urban development plan	P04
Communicating some tasks without considering the limits of Tehran Municipality's duties and powers in Tehran's urban development plan	P05
Inefficiency of regulations in guaranteeing the proposed plans for Tehran's urban development	P06
Failure to determine the role of the organizations involved and the existence of multiple and common trustees in the public sector and public institutions	P07
Obstacles in the subsystem of generation and distribution of value	Symbol
Lack of focus on creating common values for the stakeholders of Tehran's urban development plan	V01
Conflict of interest and management of ineffective conflict between the interactions of actors in Tehran's urban development plan	V02
Lack of common understanding, ambiguity, and lack of agreement in the concepts and provisions, clauses, and indicators of Tehran's urban development plan	V03
Failure to form a collective agreement based on the establishment of integrated policy-making principles of Tehran's urban management	V04
Multiple and sometimes contradicting policies of urban management in the public and private sectors of the country	V05
Lack of attention to the effects and consequences of program implementation on the level of Tehran citizens' satisfaction	V06
Obstacles in the subsystem of generation and distribution of knowledge	Symbol
Weakness in the structuring of key issues and the capacity to solve the problems of Tehran's urban development plan	K01
Failure to use scientific planning models in developing strategies and policies for Tehran's urban development plan	K02
Weakness of a systematic and meaningful connection of the perspective, strategies, and policies with the materials and provisions of Tehran's urban development plan	K03
Lack of establishment of knowledge management system in key issues of Tehran Municipality	K04
Weakness in predicting possible risks in realizing the key assumptions of formulating Tehran's urban development plan	K05
Lack of scenario planning based on possible risks and, as a result, lack of design of appropriate response according to possible scenarios	K06
Lack of coherent studies on the feasibility of plans and projects of Tehran's urban development plan	K07
The lack of a suitable and reliable statistical system for formulating Tehran's urban development planning	K08

Failure to prioritize plans, projects, and measures according to the strategies, policies, and provisions of Tehran's urban development plan	K09
Weakness in the scheduling of the program and the density of tasks foreseen in the program provisions in the first and second years	K10
It is not possible to measure the process of qualitative changes in some of the provisions of Tehran's urban development plan	K11
The existence of some abstract, unrealistic, and idealistic provisions in Tehran's urban development plan	K12
Obstacles in the subsystem of generation and distribution of aesthetics (social coherence)	Symbol
The inefficiency of the effective membership of all key actors, including the role definitions in the program to create a sense of belonging and commitment and participation toward creating the future of Tehran	A01
Weakness of motivation, commitment, and adherence to the plan among the actors involved in urban development planning in Tehran	A02
Lack of inter-institutional cooperation and coordination and realization of integrated urban management	A03
The absence of private sector participation mechanisms toward the realization of Tehran's urban development plan	A04
Weakness in using the capacities of non-governmental organizations and the private sector	A05
Inconsistency in the system of urban development planning and local development planning	A06
Absence of citizen participation mechanisms toward the realization of Tehran's urban development plan	A07

The majority of the obstacles fall under the subsystem of generation and distribution of knowledge, which has 12 obstacles. The next largest subsystems are the generation and distribution of power and those of aesthetics, with seven obstacles each. Moreover, the subsystem of generation and distribution of value with six obstacles and the subsystem of generation and distribution of wealth with five obstacles were identified. At this point, taking into account the obstacles in developing the system of Tehran's urban development planning, the ideal system of formulating Tehran's urban development plan was identified with regard to the relative consensus between the key actors.

3.2.2 Components of the ideal system of tehran's urban development plan formulation

Considering the discussed points, the components of the ideal system of formulating Tehran's urban development plan were identified and presented in Table 4 in conformity with the five subsystems.

Table 4. Components of the ideal system of formulating Tehran's urban development plan

Obstacles Components of the subsystem of generation and distribution of wealth
Existence of sustainable sources of income for Tehran Municipality
Determining the position of Municipality in the financial and economic area of Tehran
Designing economy prediction models for Tehran
Realistic financial estimates of the table of resources and consumptions of Tehran's urban development plans
Efficient budgeting system of Tehran Municipality
Compliance of financial resources with the government's annual budgets considering the dependence of the program on the government's obligations
Flexibility of financing program implementation costs in the economic environment of the country and Tehran Municipality
Components of the subsystem of generation and distribution of power
Efficiency of the macro-planning structure of the country's development and its connection with urban development plans
Efficiency of governance structure of integrated urban management
Analyzing the stakeholders and determining the role of the involved organizations and the responsibility of each transparently in the public sector and government institutions
The existence of legal mechanisms to facilitate the regulatory role of the government in the allocation of resources and relations of the cooperation network of actors to solve urban problems
Paying attention to the limits of duties and powers of Tehran Municipality in solving the problems of Tehran
Collective understanding and agreement on the role and legal position of the organizations under Tehran Municipality in solving the problems of Tehran
The existence of conflict of interest management mechanisms among the interactions of the actors involved in formulating Tehran's urban development plan
Designing the approaches of the collective agreement of the municipality and Islamic City Council in structuring the framework of Tehran's urban development plan
Clarity of the framework of the executive process and the mechanisms of approval, control, supervision, and execution of provisions in formulating Tehran's urban development plan
Meritocracy and stability in urban managers in Tehran's urban planning process
Mechanisms of transparency, accountability, and adequate monitoring of the performance of urban managers
Coordination in the system of urban development planning and local development planning
Components of the subsystem of generation and distribution of value
Focusing on the creation of common values of the stakeholders toward creating the future of Tehran
The formation of a collective agreement based on the establishment of the principles of integrated policy-making of Tehran's urban management
Changing the attitude of urban managers from a temporary and short-term approach to solving the root problems of Tehran
Common understanding and agreement on concepts and provisions, clauses and indicators of Tehran's urban development plan
Paying attention to the effects and consequences of program implementation on the general well-being of the society and the satisfaction of the citizens of Tehran
Components of the subsystem of generation and distribution of knowledge
Identifying and structuring key issues according to the intertwined and complex urban issues
Paying attention to the use of scientific methods to achieve collective agreement in order to increase the problem-solving capacity of the actors involved in Tehran's issues
Applying scientific models of problem-oriented planning in formulating strategies and policies to solve problems in Tehran
Systematic studies of the city's key issues, from structuring and identifying the root causes to reaching solutions proposed to solve the problems
Statistics system and appropriate and reliable information banks for planning key issues of Tehran
Modeling and simulating complex urban problems and identifying systemic problem-solving solutions
Forecasting possible risks in realizing the key assumptions of proposed solutions and scenario planning and formulating alternative solutions
Establishment of the knowledge management system to solve key issues in Tehran
Creating a communication network and continuously exploiting the capacity of academic elites, urban planning consultants, and Tehran Municipality experts

Coherent feasibility studies of proposed plans and projects in Tehran's urban development plan
Prioritization of plans, projects, and strategic actions of Tehran's urban development plan
Providing the possibility of measuring the progress of the program and determining the effectiveness of the program's progress in solving Tehran's issues
Dissemination of information and transparency of the municipality's performance in advancing the solution of Tehran's problems
Informing and making citizens aware of the root causes of urban problems and sharing suggested solutions
Components of the subsystem of generation and distribution of aesthetics
Effective membership of key actors, including role definitions, in the program to create a sense of belonging and commitment toward creating the future of Tehran.
Participation and inter-institutional coordination to realize the integrated management of Tehran.
Coordination and framing of the planning structure based on the collective agreement of the municipality and the Islamic City Council of Tehran
Incentive policies of employee participation to make them motivated and committed to the program among development planning actors in Tehran
Predicting efficient performance evaluation systems for urban employees and managers
Citizens' general trust in Tehran Municipality's decision-making and plans
The existence of the participation mechanism of citizens and the private sector in the realization of Tehran's urban development plan
Incentive policies for citizen participation and utilizing the capacity of the private sector and non-governmental organizations.

3.3. Step 4: Developing a conceptual model of an ideal system of formulating tehran's urban development planning

The ideal system of Tehran's urban development plan formulation encompasses components that Tehran Municipality considers with the purpose of developing the system of plan formulation in an ideal system. As was also mentioned, the development of the ideal system was achieved by considering the understanding, perception, and mental model of the research participants on the experience gained in formulating Tehran's fourth urban development plan and extracting the tacit knowledge of managers through an intervention process and semi-structured interviews. The system intervener drew conceptual models of system development based on the perception of the problem situation, content analysis, and extraction of themes from the interviews of the participants, eventually finalizing the extracted models through a verification procedure.

Accordingly, given the components of an ideal system of Tehran's urban development planning formulation, it was designed based on five mess formulation subsystems, including the subsystems of generation and distribution of power, wealth, value, knowledge, and aesthetics. It was assured that the perceptions of the key actors involved in the problem would be extracted in a format conforming to the concepts of the ideal system.

Figure 3 illustrates the conceptual model of developing the ideal system of Tehran's urban development planning formulation. Since the modeling procedure is a learning cycle, the modeling procedure of the ideal system of Tehran's urban development planning formulation

requires that the performance of Tehran's urban development planning formulation be evaluated based on the ideal system, the criteria of efficiency and effectiveness be determined in each stage, and the quality of implementing the solutions of developing a system of plan formulation be monitored so that the planning progress can be analyzed with the expectation of solving the problem.

It is also necessary that controlling measures be examined for identification of implementation obstacles, an evaluation be conducted taking into account the changes and the environmental limitations over appropriate intervals, and the components of the ideal system also be evolved in a learning cycle. Furthermore, a set of five criteria (5E) of efficacy, efficiency, effectiveness, ethics, aesthetics, and delicacy were evaluated based on the evaluation criteria of conceptual models by asking a number of questions from the participants, and the key actors confirmed them through a verification procedure.

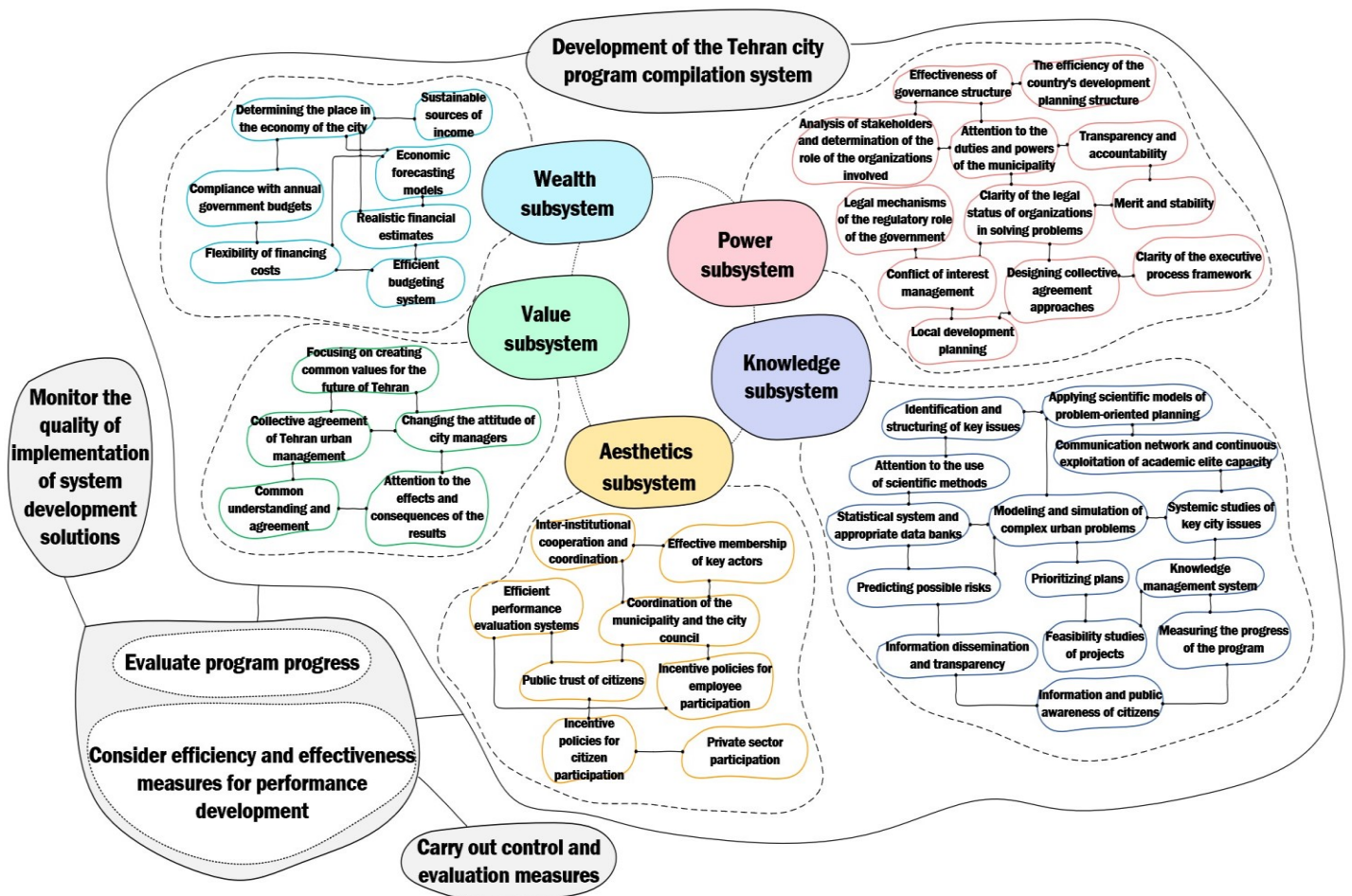


Figure 3. Model of developing the ideal system of Tehran's urban development planning formulation: Source: research findings

3.4. Step 5: Comparing the model with the real world

The model was compared with the real world in accordance with the four analyses put forth by Checkland (1990): First Comparison) Based on the developed conceptual model, prior to the presentation of the model to the participants, a number of questions were issued by the intervener, and discussions on the necessity of change were carried out among the key actors in formulating Tehran's urban development plans; Second Comparison) In this comparison, the conceptual model was analyzed by referring to the structure of urban development planning formulations programmed before; Third Comparison) The Developed conceptual model was presented to the participants, and the comparison was made with regard to the current situation of plan formulation in Tehran Municipality; Fourth Comparison) The details of the conceptual model of the ideal system were examined and compared with the details of what presently exists, and the overlaps between the conceptual model and the current real model were identified.

3.5. Steps 6&7: Identifying desirable systemic and culturally feasible changes and executing them

In the next step, possible changes were defined according to the gap between the current and ideal situation with the participation of experts. The two final stages emphasize the importance of maintaining two logical and cultural trends: the logical trend addresses the importance of the validity of the conceptual model in the form of systemic thinking, and the cultural trend considers the decision-making regarding the implementation of desirable systemic changes to require commitment and agreement between the key stakeholders. To this end, it was ensured that the proposed changes and solutions were in line with the existing development plans and facilities. The results of these steps are presented in the discussion section.

4. Discussion

Based on the research findings, the following practical suggestions for developing a system of formulating Tehran's urban development planning are proposed as follows:

The efficiency of the integrated urban governance structure with emphasis on the regulatory role of the government

Considering the inefficiency of the urban management governance structure, it is suggested that the follow-up of a comprehensive urban management plan be placed on the agenda and, accordingly, participation in revisiting the upstream laws in order to realize the integrated urban

management based on the regulatory role of the government in dedicating resources and the relationships in the cooperative network of urban management actors be realized.

Follow-up and negotiation for the alignment of the urban development plans with the country's development plans

Considering the inefficiency of the country's development macro planning structure and the absence of a meaningful connection between the urban development plans, it is suggested that, while making efforts to strengthen the relationship between the macro policies of the municipality and Tehran's urban development plans with the macro policies of the country's development plan, the actors of the plan development in Tehran Municipality follow up and negotiate with the key actors of development plans of the country in order to establish the legal position of the municipality in determining the roles and responsibilities of the program and create legal support for the coordination and communication of the key actors of the development plans.

Creating an inter-institutional cooperation network and planning negotiations with key stakeholders on the key issues

Considering the complexity and intertwining of urban issues, it is suggested that the stakeholders be analyzed and the role of the involved organizations and the duties of each in the key issues of Tehran be determined in the public sector and the government institutions of the country. Moreover, according to the power and influence of each of the actors in solving the issues, the planning of negotiations and the creation of an inter-institutional cooperation network should be addressed.

Planning the approaches of the consensus reached by the municipal planners and the Islamic City Council in the structuring of the plan formulation

Considering the challenges that exist in the process of program approval, it is proposed that in order to have a common understanding of the planning framework for the urban development of Tehran, the decision-makers of the Islamic City Council be involved in the plan formulation procedure from the beginning of structuring the urban development plan framework through a soft system intervention process so that the representatives who participate in the specialized committees for formulating the plan are also the appraisers of the plan in the process of approving the plan in the Islamic City Council so as to prevent later fundamental changes.

Strengthening mechanisms of transparency and accountability for the performance of city managers

A lack of transparency and insufficient monitoring of the performance of city managers during the program will cause a challenge in achieving the goals. Hence, strengthening transparency and accountability through the publication of the performance report of city managers toward solving the key problems of the city, according to the public and private revenues at the disposal and the expenses of the units under management and how the development resources are spent toward realizing the plan, is highly recommended. In addition, it is intended to recognize the right of financial supervision of the Islamic Council of Tehran and the supervision of the Islamic Council and other supervisory institutions.

Absorbing sustainable sources of income for Tehran Municipality

Considering the limited sources of sustainable income and the fact that Tehran Municipality's income falls short of city duties and taxes, as well as the high dependence on government obligations, it is suggested that Tehran Municipality identify and evaluate the system of absorbing sustainable sources of income. In addition, by pursuing the legal approvals of providing financial resources and presenting analytical reports of the city's issues, and on the basis of negotiation and persuasion, it is expected that they explain the financial relationship between the government and the municipality in order to solve the city's issues.

Determining the position of the municipality in the field of finance and economy of Tehran city

Due to the uncertainty of Tehran Municipality's position in the area of finance and urban economy and considering the lack of experts in this field, it is suggested to recruit specialized experts and qualified economic consultants to design an estimation model of the gross production of Tehran city and prepare an input-output table of Tehran city.

Designing prediction models of Tehran's economy

Given the absence of basic information on the urban economy, it is suggested that income and expense prediction models of the Municipality be accurately estimated by updating the information and data on the urban economy. As a result, the consequences of macro decisions on the economy of Tehran will be predictable, and the table of resources and expenses of the program based on prediction models will be developed in a scientific and realistic manner.

Redesigning the budgeting system of Tehran Municipality

Considering the inefficiency of the budgeting system and the lack of alignment between the plan and the budget, it is suggested that the budgeting system of Tehran Municipality be redesigned while integrating the budget systems and updating the cost data. In this vein, the compliance of the municipality's financial resources with the government's annual budgets should also be taken into account.

Flexibility of financing the costs of implementing the program with regards to the uncertainty of the economic environment

Although generally, the effects of inflation on the amount of income sources and the current and implementation costs of the program are normally considered based on the continuation of the previous process while developing the program, it is suggested that, in addition to financial planning based on economic prediction models, the value of Tehran Municipality services be engineered. Some research efforts must be made in order to improve the efficiency of the services value chain. In addition, economic analyses of cost reduction based on possible scenarios should be planned.

Identification and structuring of key issues with regard to the intertwinement and complexity of urban issues

Considering the axiomatic position of the actors involved in the planning formulation regarding the causes and solutions of urban issues, it is suggested to first identify and analyze the communication network of Tehran city issues and the statistics of the key issues according to the results of the network analysis and then to consider the typology of the complexity of the key issues in Tehran.

Capacity building for solving Tehran's problems by the key actors

Considering that the agreement on the dimensions of urban issues has been created only at the level of the principles of the planning formulation, it is suggested to plan a soft system intervention with all the key actors to enhance the capacity of the solutions to urban issues, including the government, the public, and the people's sectors.

Applying scientific models of problem-oriented planning in formulating strategies and policies to solve the problems of Tehran

Despite the emphasis on the main problem, the program formulation lacks a problem-oriented planning model. It is suggested that systematic studies of the causes and suggested solutions to

solve complex problems be carried out with the participation of academic elites and Tehran Municipality experts.

Creating a suitable and reliable statistics system and data banks for planning the key issues of Tehran

Due to the lack of appropriate statistics and information for researching and analyzing the urban issues of Tehran, it is suggested that while designing an information system of Tehran's key issues, the required databases be identified and the suitable and timely data and information to support decision-making based in the design of the information systems be collected.

Modelling and simulation of complex urban problems and identification of systemic solutions to the problem

Considering the absence of supporting models for decision-making and simulating the situation of key problems in Tehran, it is suggested that systems modeling studies of complex problems in Tehran be carried out. Implementation and decision-making support models should be made based on simulating the problems, testing the strategic assumptions of the actors on the model, and problem behavior analysis.

Predicting possible risks in realizing the key assumptions of the proposed solutions and scenario development and planning of alternative solutions

Considering the lack of program risk management and the absence of alternative scenarios for solving the key issues, it is suggested that while revealing the strategic assumptions in solving the key issues agreed by the actors, the risk management and development of varied scenarios and alternative solutions should be conducted.

Establishing a knowledge management system for solving key issues in Tehran

Considering the importance of knowledge management in building the capacity to solve complex problems, it is suggested that the specialized knowledge areas of urban management issues be identified and that the knowledge management system for urban issues in the subsystems of Tehran Municipality be designed. In the process of organizational planning, the experiences of managers in the implementation of the documentation program, as well as the tacit knowledge, should be recorded in the organization's knowledge management system. In addition, it is recommended that the successful experiences and initiatives in the cities of the country in solving the problems of metropolises be evaluated and reviewed, as well as the successful experiences of the neighboring countries in solving urban problems.

Creating a communication network and continuously exploiting the capacity of academic elites, urban planning consultants and experts of Tehran Municipality

Given the lack of proper use of the capacities of urban planning specialists and consultants, it is suggested that the processes of employing specialized academic and professional consultants in the study and planning center of Tehran city be made agile and while expanding the range of research associates and organizational consultants, focus should be on ensuring the efficiency of the selection process of competent consultants. It is also emphasized to establish that a stable cooperation relationship be established and to train that specialized organizational consultants be trained in order to increase problem-solving capacity.

Coherent studies of project feasibility and the requirement to prepare environmental and social safety and passive defense annexes for the macro projects of the Tehran city development program

Considering the insufficient studies conducted on the feasibility of the proposed plans and projects, it is recommended that feasibility studies be conducted on the proposed metropolitan plans and projects. These studies would necessitate the preparation of environmental and social safety and passive defense annexes by independent consultants, along with the necessary monitoring and evaluation mechanisms and the required executive guarantee.

Prioritization of plans, projects and strategic measures of Tehran's Urban Development Plan

Considering the lack of prioritization of the plans and measures presented in Tehran's urban development plan, the plan prioritization framework based on multi-criteria decision-making methods should be used to determine the degree of importance of the program's provisions.

Dissemination of information and transparency of the municipality's performance in advancing the solutions to Tehran's problems

Considering the limited number of reports published by Tehran Municipality, it is suggested that efficient systems of evaluating and monitoring the program's performance be designed and that realistic performance reports on the program's progress be published in a timely manner to solve urban problems.

Providing information and raising public awareness of the root causes of urban problems and sharing the suggested solutions

Considering Tehran's key role in solving urban problems, appropriate content should be

prepared and produced according to this role and published in public communication channels to inform citizens. Citizenship and family-oriented education systems focused on Tehran's key issues should also be designed.

Focusing on the creation of the common values of the stakeholders based on the creation of the future of Tehran

Considering the ambiguity in Tehran's future image, it is suggested to create a realistic perspective based on consensus, awareness, and training. Efforts should be made to create common values among key stakeholders in solving Tehran's problems.

Changing the attitude of urban managers from a short-term and intermittent approach to solving the root problems of Tehran

According to the current approach, the managers have a short-term attitude towards solving urban problems. The time-consuming nature of solving development problems, the instability of managers, and the complexity of the problem-solving processes led to the creation of a governing short-term attitude. In order to change this approach, it is suggested that the complexity of the problem situation, the process of solving urban problems, and the performance of city managers in solving complex problems during the years of the program be clarified. In addition, it is suggested to manage the expectations of stakeholders by informing them about the delays and the time-consuming nature of the process of solving complex problems.

Considering the effects and consequences of implementing the program on the general well-being of the society and the satisfaction of the citizens in Tehran

Due to the lack of transparency regarding the consequences of the program on the satisfaction of the citizens and the general well-being, it is suggested to identify the real dimensions of the expectations of the citizens in Tehran from the municipality and to test the results and consequences of the strategic assumptions of the program by using the design of dynamic models according to the dimensions of citizens' satisfaction.

The effective membership of the key actors including role definition in the program in order to create a sense of belonging and commitment toward creation of the future of Tehran

Considering the inactivity of the workgroups of the districts and the neglect of the citizen's role in the urban development program, it is suggested to address participatory management based on mutual trust and utilization of the capacities of people, managers, employees, and

other stakeholders, and plans should be made for the realization of this partnership at the level of Tehran Municipality's subdivisions, the 22 districts, neighborhood management, and citizens.

Incentive policies for employee participation to foster motivation and commitment the program among the actors of Tehran's urban development planning

Although acknowledging and appreciating the participants in the plan formulation was done by the secretariat of the supreme group of the fourth plan, there is no general incentive policy for all employees. In order to strengthen participation, it is suggested that employees be educated and raised awareness about the role of employees in the process of solving Tehran's problems and that encouraging and supportive laws be introduced for the employees' initiatives in reducing the key problems of the city. In this regard, it is suggested that a detailed reward program based on the participation of the employees of municipal organizations and subdivisions be formulated based on solutions to the key issues of the city.

Strengthening citizens' general trust in Tehran Municipality's decision-making and programs

Considering the lack of a study on the level of public trust in Tehran Municipality, it is necessary to build citizens' trust in the municipality's programs. In this vein, it is suggested to introduce the programs of Tehran Municipality in the mass media to build citizens' trust and promote citizens' media culture to prevent the spread of false news and information and use behavior patterns generally accepted by citizens in guiding public opinion.

Existence of citizens' and private sector's participation mechanisms toward realization of Tehran's urban development plan

Considering the absence of citizens and private sector participation mechanisms in realizing the program objectives and solving urban problems, it is suggested to identify the capacities of the people and the private sector in advancing and solving the key issues of Tehran, hold seminars with the representatives of the private sector of the country, and create an atmosphere of collaborative management.

Utilization of the capacity in the private sector and non-governmental organizations

In order to benefit from the capacities of citizens, the private sector, and non-governmental organizations, it is suggested that knowledge-based companies and start-up businesses be supported in providing creative solutions to urban problems, and basic economic policies should be designed with support-incentive approaches. In this regard, seminars should be held to

provide information on supportive policies. Conclusions

This research has analyzed the obstacles and identified solutions to improve the development program system of Tehran city by compiling the disorder and using the soft systems methodology during a systemic intervention with the practical planning of the learning process. The innovative research method embeds the chaos formula in the methodology of soft systems. In general, the findings of the research indicate that Tehran's urban development planning requires a fundamental change in the approach to planning and solving complex urban problems. This applied research is one of the systems thinking approaches in learning in practice and managing the complexity of the diversity of views of urban planners in the experience of urban development planning in Tehran.

5. Conclusion

This study was an effort to spread problem-oriented approaches to recording organizational experiences and execute the organizational learning process based on modeling Tehran's urban development plan formulation problem. Since no similar research has been done on the issue of planning in Tehran, the dimensions of the problem, and the presentation of solutions in a holistic and systemic approach, it is not possible to compare the results clearly. However, the findings of the current research are in line with the findings of [Moulai et al. \(2018\)](#) regarding the weak participation of non-governmental organizations, the private sector, and people, and the lack of communication between programs and budgets in Tehran Municipality, and the findings of [Shahrabi Farahani et al. \(2022\)](#). In addition, the application of soft system approaches based on agreement and consensus between the diverse perspectives of stakeholders in managing the complexity of urban issues, such as the research of [Markou \(2022\)](#) emphasizes [Nasiri et al. \(2022\)](#) and [Delima et al. \(2020\)](#).

As the present problem is defined at the border of the supreme group system of formulating Tehran's fourth urban management plan, it is possible in future studies to expand the scope of the analysis of the system of formulating the plan and analyze in the problem of plan formulation the views of citizens and actors outside Tehran Municipality, including specialized commissions of the Islamic City Council of Tehran or the other actors who are mentioned as institutional mapping in the program. Considering the identified components of the system of Tehran's urban development plan formulation, it is suggested to consider the relationships between the components of the subsystems of the model, the dynamic complexities of the development of the identification system, and the causal relationships between the system

components in order to design cognitive maps of the system of Tehran's urban development plan formulation. In terms of the key issues, it is suggested that strategic studies be conducted on the basis of the problem. Based on the typology of the complexity of the problem, study teams composed of academic elites, researchers, urban planning consultants, and system analysts should be created. System modeling of the solution should be addressed with group participation appropriate for the problem situations. In future studies, it is suggested that the dynamic model of Tehran's urban planning performance system be designed and strategies and policies to improve the urban planning performance system based on the dynamic system model be identified. Moreover, in order to benefit from the experiences of other countries in urban issues and evaluate and realistically compare the performance of urban management in solving urban issues, it is suggested that in future research, a realistic evaluation of the performance of Tehran Municipality should be carried out. By conducting comparative studies of the performance of urban management, it would be possible to compare and benefit from successful experiences and to find points for improving the effectiveness of the planning system of Tehran. Finally, it seems that problem-oriented and systemic approaches to complexity management in the field of urban management have received less attention from researchers, and it is expected that this research gap be studied by focusing on the challenges of urban management and considering the theories of this field to propose system solutions regarding various problems of urban systems.

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