Design of Good Budgeting Model in Public Division of Iran with Total Systems Interventions (TSI) Approach

Leila Mirzadeh*, Mohsen Ghavamipour

Department of Social Sciences, University of Tehran, Tehran, Iran

Research Article

ABSTRACT

Budgeting in the public sector is an issue that numerous researchers in all countries are interested in. Therefore, extensive research has been done on budgeting reforms, types, methods and models (such as, performance based budgeting, participatory budgeting and, etc.). The present study also seeks to design a model of budgeting that provides a tool for measuring public budgeting in Iran that contain the components of good budgeting at each stage of the process (*i.e.,* policy making and formulation, implementation, approval and monitoring of the budget). Due to the complexity and extent of issues (economic, social and political) related to public budgeting, the use of new analytical methods is required for research in this field. Accordingly, the Total Systems Interventions approach (TSI) helped us to identify and select appropriate methodologies for recognizing and diagnosing the general budgeting system. Based on the results obtained from this approach, a Soft Systems Methodology (SSM) was selected to recognize the desired system. Consequently, Critical Systems Heuristic (CSH) and Viable System Model (VSM) were selected for its diagnosis. The combination of these methodologies in investigating the budgeting system, allowed that each of its subsystems were identified based on the VSM. Then, whit identification of the existing deficiencies, the research model was designed. Finally, this study provided a list of good budgeting components that were approved by experts in this field along with, suggestions for reform of the budgeting system and future research.

The statistical population of this research is experts in the field of system and budgeting in the court of accounts, the plan and budget organization and members of the parliament.

Data collection tools are in-depth semi-structured interviews with 16 experts.

Keywords: Good budgeting; Total systems interventions; Critical system heuristic; Vible system model; Soft system methodology

INTRODUCTION

Budgeting is a process by which people (members of the legislature, public servants and others) participate in different perspectives and arrive at the allocation of resources). It seems that the environmental changes in which governments and organizations are competing will affect the way of budgeting [1]. Due to these changes and complexities, governments need to take rational measures, especially in the field of proper planning, decision making and coordination in matters related to the needs of communities. This need has made budgeting in the public sector more complex. Therefore, it requires combining information from multiple sources, considering different stakeholders and putting together different perspectives. In the budgeting system, the performance of employees, managers, stakeholders, and various cultural and political factors play a critical role. So, this put a complex set in front of the decision maker [2]. Therefore, public budgeting in today's complex and dynamic conditions requires new Analytical methods. Thus, methodologies and models of analysis and problem solving should be developed. This research uses comprehensive system approaches that have reasonable capabilities in diagnosing the public budgeting system. Based on what a for mentioned above, the total systems interventions approach was selected to identify and select the appropriate system methodologies and, will be explained in the following sections. Therefore, the main question of this paper is "What the model of good budgeting in the public sector of Iran is". And, the sub questions are determining components of a good budgeting model in its stages of policy making, formulation, approval, and implementation and monitoring of the budget [3].

Good budgeting: Budgeting is one of the most important tasks of the government and is considered as one of the most acceptable and rational tools through which governments allocate resources to provide goods and services needed for the welfare of the people. Caiden describes Allen Shayk's views of good budgeting. The starting point of Allen Shayk is the changes in the public budgeting environment and the adaptation of governments to face those changes [4].

According to Caiden, in the face of global developments, governments are seeking to expand investment in infrastructure, education, research, energy and technological innovation, and to address essential challenges such as nuclear waste disposal, climate change and natural disasters. He emphasizes that governments need stronger, more robust budgeting processes that can build the capacity to create and implement sustainable policies.

In his approach, an effective budget should create a stable financial position for the medium term. The budget should facilitate resource change more effectively, use higher priorities, encourage units to implement more effectively, available to citizens, and respond to their needs [5].

These criteria are consistent with the introduction of Olomola, which defined discipline, efficiency, and effectiveness as the hallmarks of sound budgeting. Other features of good budgeting that stand out include the highest standard of financial control, independent auditing, and a greater focus on delivering results in program design and evaluation. Discipline, availability or transparency and accountability as well as stability are identified. Based on this, it can be summarized that good budgeting is characterized by efficiency, effectiveness, coherence, discipline, availability or transparency and accountability, as well as stability. Caiden attributed good budgeting to factors such as adequate and accurate information, timely and accurate reporting, and accurate recording, the ability to predict costs and trends, and skilled staff [6].

Tayib and Hussin in a study of good budgeting practices in Malaysian public universities stated that good budgeting is defined with features such as involvement of managers, clear definition of long term goals, rational allocation of resources and control processes leading to Continuous business improvement. The review of the literature in the field of good budgeting reveals the challenges and complexities in this field, which explains the need to use systemic approaches in designing budgeting models. The approach used in this research is defined in the following sections [7].

Total systems interventions

A particular type of Critical Systems Thinking (CST) is one that emphasizes the promotion of methodological and theoretical pluralism. The dominant expression of this thinking is Total Systems Interventions (TSI). The total systems intervention demonstrates an approach to planning, design, "problem solving" and evaluation. Therefore, it includes three stages of creativity, selection and execution [8].

Its main theoretical tool is a contingency approach for selecting methodology based on paradigm analysis as well as to extent metaphorical analysis. It is believed that there is no best systemic methodology and further the situational aspects of the problem determine the most appropriate tradition of systems thinking as a methodological guide and specific methods and tools of intervention.

The total systems intervention is based on the initial classification of systems methodology called the System Of Systems Methodology (SOSM). SOSM Provides a matrix for classifying systemic methods in two dimensions, first the level of complexity of the problem situation (simple or complex) and second the degree of common goal among the participating stakeholders (unitary, pluralistic or forced relations). The following Table 1 shows a system of systems methodology developed in 1991.

Table 1. The extended System Of Systems Methodologies (SOSM).

Participants dimension of contexts (increasing diversity of values)			
	Unitary (paradigm: Functional) hard system thinking	Pluralist (paradigm: Interpretive) soft system thinking	Coercive (paradigm: Emancipatory) emancipatory system thinking
Simple	Simple-unitary problem contexts (systems metaphor:Machine) Systems Engineering (SE) Operational Research (OR) Systems Analysis (SA)	Simple-pluralist problem contexts (systems metaphors: Culture, coalition) Systems approach (Churchman) Strategic Assumption Surfacing and Testing (SAST)	Simple-coercive problem contexts (systems metaphor: Prison) Critical Systems Heuristics (CSH)
Complex	Complex-unitary problem contexts (systems metaphors: Organism, brain) Organizational cybernetics/Viable Systems Diagnosis (VSD) Socio-technical systems thinking	Complex-pluralist problem contexts (systems metaphors: Culture, coalition) Interactive planning (Ackoff) Soft Systems Methodology (SSM)	Complex-coercive problem contexts (systems metaphor:prison)

The first version of TSI was proposed by Flood and Jackson. Morgan suggests that all system methodologies are assumed to be based on a specific organizational metaphor. The second version of the TSI was proposed by Flood and Romm, which is

more flexible than the first version. For example, the creative phase does not rely solely on metaphorical analysis, but also combines methodologies based on the purpose and principles of the methodology, and allows the researcher to develop a new methodology [9].

The above discussion of the total interventions systems shows how the situation of the problem is well identified using this approach. Then appropriate combination of system methodologies with different paradigms is selected for dealing with that problem. System methodologies identified and mixed in this study are as follow.

MATERIALS AND METHODS

Methodology selection process

The purpose of this study is to use the TSI approach to select appropriate system methodologies and then the diagnosis of the budgeting process and provide good budgeting indicators. Accordingly, the status of the problem, existing paradigms and Morgan's nine system metaphors (machine, living thing, etc.) are studied [10]. Then according to the position of the problem based on the SOSM Table 1, the purpose and Basic principles of methodologies and the results of interviews, appropriate methodologies are selected to design a good budgeting model. Figure 1 shows the process of selecting methodologies.

As it is shown in the above model, the policy making stage, according to the purpose of methodology, *i.e.,* system recognition and critique, the CSH methodology has been selected. In the budget approval stage, according to the pluralism discussion, the metaphor of political coalition is used to identify the elements involved in budgeting, stakeholders, customers, etc. So, SSM and CSH methodology has been selected. In the implementation and monitoring stage, according to the degree of unity of purpose and the metaphor of the brain and the organism, VSM methodology has been selected [11].

Accordance to the purpose of the research, *i.e.,* system diagnosis, VSM is considered as the dominant methodology with less dependence on paradigm and metaphorical analysis for all stages of the process. It is mixed with other methodologies as SSM and CSH methodology.

Figure 1. Research model based on Total Systems Interventions approach (TSI).
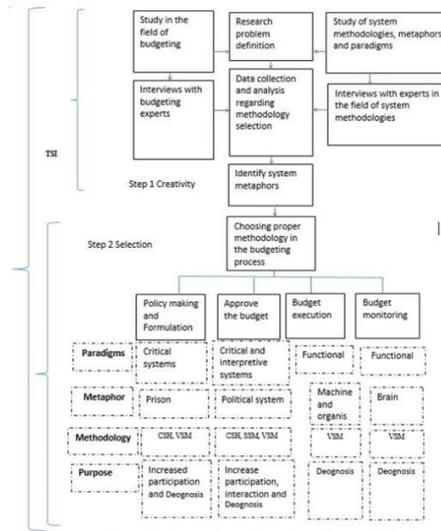
Selected methodologies in research

Soft System Methodology (SSM): This methodology was developed by Peter Checkland in 1960 and is based on the view of interpretation.

In this methodology, a method called CATWOE is used to analyze the stakeholders, which has subdivisions.

C-Customers

A-Actors

T-Transform

W-Worldview

O-Owners

E-Environmental factors.

In this research, CATWOE elements are used in the system identification stage.

Critical Systems Huristics (CSH) methodology: This methodology is one of the dominant approaches to critical systems thinking developed by Werner Ulrich. This methodology organizes the components of a system and its environment into four main categories (motivation, control, expertise and legitimacy). Each category has three components that enhance the possibility of border critique. As a result, this methodology has twelve components that are used in this research to evaluate the results [12].

Viable System Model (VSM): In the 1970's, Stafford Beer, a cybernetic scientist, identified the conditions of existence of living systems such as biological organisms to study the possibility of a relationship between them and social systems such as organizations. He identified a number of organizational requirements to prove viability. The model he eventually developed is called the viable system model. Viable system modeling should be considered one of the most powerful tools in the study of organizational structures. Viable Systems Molel explain the five different functions that must exist in all viable systems. Beer used the terms 'system 1′, 'system 2′,… up to 'System 5 to represent essential management functions. The basic model can be used in two ways. By mapping the model for each particular organization, it can be used to diagnose complications and weaknesses and problems [13]. The model can also be used to design a more effective organizational structure. Figure 2 shows the general model of the Viable Systems Molel.

Figure 2. VSM.
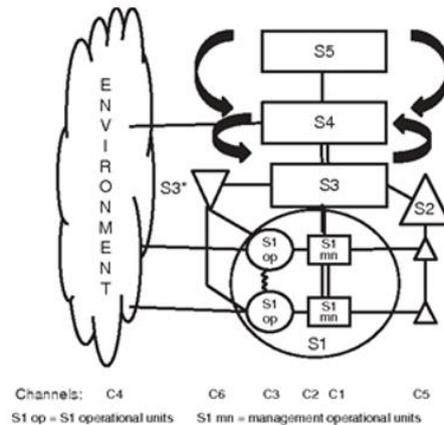
As explained below, the model of viable systems consists of 5 subsystems as follows and communication channels.

S1-Operational units: This system includes various operational units that perform the essential tasks of the organization. These units interact directly with their environment.

S2-Coordination system: This system is responsible for coordinating operational units. This system confirms the stability in system-1 by managing the conflicts arising in it [14].

S3 and S3*-Management and control: S3 manages operational units. Its purpose is synergy and optimization of the system as a whole. S3* Supports S3 in its control task through auditing.

S4-Outside and future: System 4 explores external trends and possible future threats and opportunities and supports the system in adapting to future and external aspects [15].

S5-Normative management: S5 is responsible for determining the mission, goals, objectives, values and culture of the organization and introduces the system to the outside environment. It also manages conflicts over resource allocation between S3 and S4.

The application of viable system model in organizational management control systems (budgeting) and the relationship (ERP) with it has been investigated in a study. In this research, this model is used to identify and diagnose the budgeting system in the public sector of Iran. The model of the viable system in this research is the model considered by Michael Jackson, which is summarized as follows:

In Jackson's methodology, to identify the existing nature of the system, actions such as defining the goals of the system, determining the system in focus, unravelling the complexities and levelling the system are performed. In the pathology phase, the existence and quality of subsystems (1 to 5), which we call implementation, coordination, operations control, development and policy, as well as information channels and frequent errors are considered [16].

In the proposed methodology of this research, the CATWOE elements introduced in the soft systems methodology are used to identify the key stakeholders of the system.

Also, information flows and communication channels are examined based on the flows introduced in other methodologies of the viable system model [17].

In 2010, press added seven streams to a total of 31 data streams of the Ashterberg and Werners models that must be in place for the system to survive, and a total of 38 streams of information have been expanded in the mana systems model.

Proposed mixed methodology of research: As mentioned, the methodology used in this research is a mixed of three methodologies. Viable system model has been selected as the dominant methodology for system identification and diagnosis. Soft systems methodology for identifying system stakeholders and critical systems huristic methodology for analyzing results are mixed with this methodology Figure 3.

Figure 3. Mixed methodology in this research.
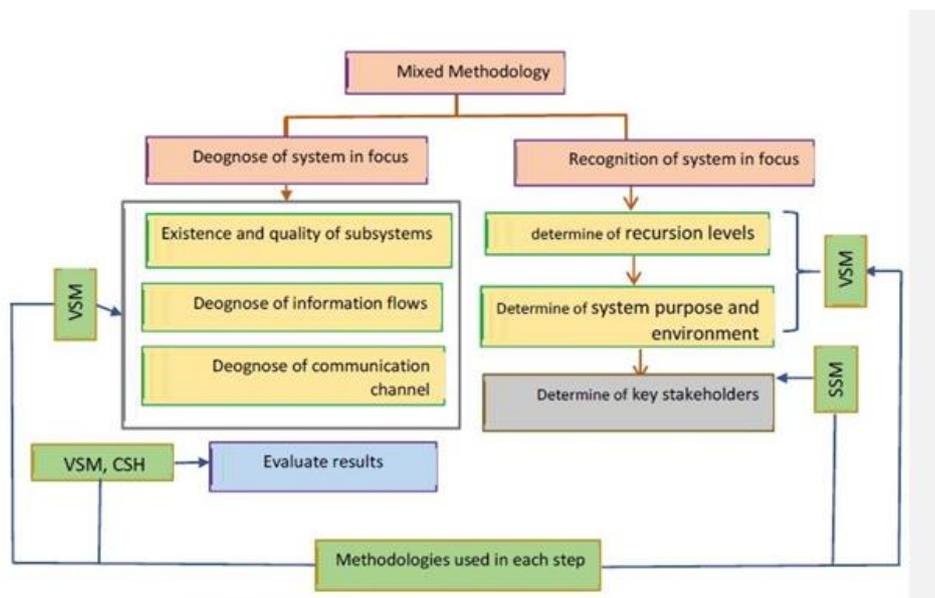
The requirements of the viable system model, which are discussed in different methodologies of this model, are as follows: As shown in the Table 2, one of the requirements of this model is to identify key stakeholders, and since it is not mentioned in Jackson's methodology, this requirement is examined based on the soft systems methodology (Table 3) [18].

Viable requirements and requirements of budgeting system

According to the stages of the budgeting process, its requirements are presented in the following Table 2.

Table 2. Requirements of the budgeting system and compliance with the viable system model.

Budgeting system requirements	Viable system model subsystems
Environmental assessment (internal and external environment)	In the viable system model, subsystem 3 is related to the internal environment and subsystem 4 is related to assessment and compatibility with the external environment.

Policy making and communication of the budget directive	The policy making task in the viable system model is the responsibility of subsystem 5.
Budget formulation	Given that this part of the process is the duties of operational units as well as management, so it is related to systems 1 and 3.
Approval of the budget	This task is related to systems 3 and 5.
Budget execution	The task of execution in a system is the responsibility of the operational units related to subsystem 1.
Budget monitoring	The task of monitoring and control in viable system is the responsibility of 3 and 3* subsystems.
Coordination between operational units and other subsystems	In the viable system model, the task of coordination is the responsibility of subsystem.

Table 3. Viable system model requirements and mixed methodology.

| Stage of methodology	The methodologies used in the mixed methodology	Requirements of viable system model
Identification of system in focus	VSM	Determine the purpose and environment of the system.
		Unravel the complexities and determine the focal system.
	SSM	Identify key system stakeholders.
Diagnosis of system in focus	VSM	Study the existence of subsystems and their quality. Study information flows. Study communication channels.

RESULTS

Research findings

Findings of the first step: The findings of this step are presented in three sections.

- Determining the system in focus.

- Determining the purpose and environment of the system.

- Determining the elements of CATWOE.

Step 1-stage 1: Determine the system in focus

According to Jackson's methodology, to understand the existing nature of the system, it must identify the system associated with achieving the goals (in organizational cybernetics, this system is called the "system in focus " and is located at level 1. The system of which the system in focus is a part (larger system, environment) is considered a zero level system. The enduring components of system 1 (unravelling the complexities) that make up the system are also secondary level [19].

In order to determine the levels of recursion in this study, the criterion of "budget classification based on budgeting in the private sector and the public sector" has been used. It is studied as Figure 4.

Figure 4. Determining system in focus and recursion levels in viable system model modelling.
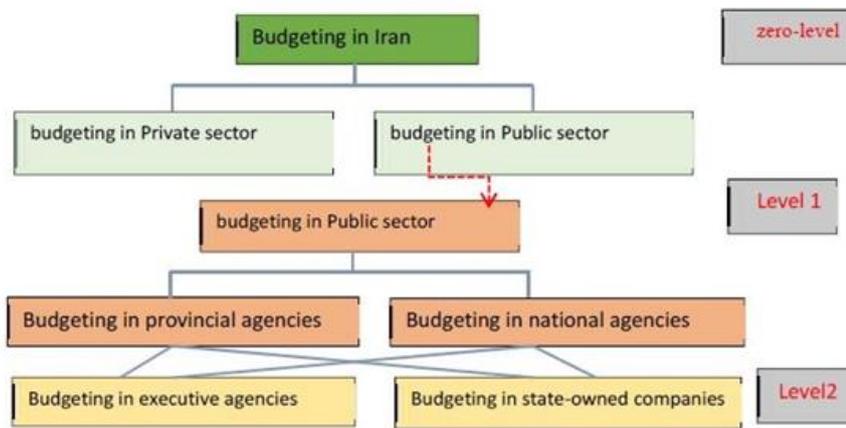
As can be seen in the figure above, the system in focus in the present study is the budgeting process in the public sector of Iran, zero level of which is budgeting in Iran (larger environment) and level 2 is components of the system in focus, *i.e.,* budgeting in executive bodies and state companies (Table 4) [20].

- **First step-second stage:** Determining the purpose and environment of the system.

- **The purpose of the system:** Public budgeting systems are designed to perform several important functions: Such as setting budget priorities, planning expenditures in pursuit of a long-term vision for development, and exercising financial control over inputs to ensure Budget discipline, operations management to ensure budgetary discipline, operations management to ensure the efficiency of government operations and provide tools to hold the government accountable to citizens.

Table 4. Types of environments in the public budgeting system.

Political/institutional environment	Social environment	Economic environment
The budgeting process takes place in a highly political environment. Legislators, executive officials, and civil society influence how resources are allocated.	Conditions of people in society, sociological characteristics and …	A country's economic conditions affect the budgeting process.
Technical environment.	Legal environment.	Geographical environment.
All related technological changes, including new tools and systems in the field of information technology.	In general, all the upstream laws and in particular the budget law.	Geographical environment of throughout Iran.

System environment: The decision environment includes important factors that are likely to have an impact on the system but are beyond the control of decision makers to limit their use of resources and ensure their responsibility for the use of resources. In the public budgeting system, the different types of environments that seem to influence budget decisions are summarized in the Table 4.

Step one- Stage three: Determining the CATWOE elements.

According to the studies performed in the budgeting process, these elements are shown in the Table 5.

Table 5. CATWOE elements in the public budgeting process.

Customers	Everyone in the community is considered as customer of budgeting system.
Actors	Executive, legislators, regulators and civil society.
Conversion process	Allocate resources to achieve the purpose of the budget and the welfare of more people.
World view	Optimal allocation of resources to achieve budget purposes and community welfare.
The owner	Government (country plan and budget organization).
System environment and its limitations	Political, economic, social environment, etc. (Restrictions include lobbying of officials, multiple purposes, limited budget, etc.).

Second step: Diagnosis of system in focus based on VSM

Study the existence and quality of 5 subsystems and examining its features.

Study system 1 of system in focus

Given that the preparation, formulation and implementation of the budget is one of the main activities of the budgeting process, the elements related to these activities is considered as a subsystem (1) of VSM, which itself includes several activities.

Each of the components of subsystem 1 in the horizontal dimension consists of 4 sections as Table 6.

Operational unit- Management of operational units- System 2 for each operational unit- Dedicated environment.

Table 6. Each of the components of subsystem 1 in the horizontal dimension.

The components of system 1	Constraints and requirements
(OU1) Units for presenting the proposed budget of the province and monitoring it.	Twenty year vision of the Islamic Republic of Iran.
	Cabinet regulations and instructions.
	Budget circular.
	Budget law and its notes.
	Five-year economic development plan law.
	Budget agreement between the program and budget organization and executive agencies.
	Budget execution rules.
(OU2) Units that responsible for proposal program, implementation and performance reporting	Performance reports of executive agencies.
	Report of the research center of the parliament.
(OU3) Units for preparing and approving the budget of state-owned companies and its implementation	Budget deduction report.
(OU4) The unit for compiling the budget of the whole country and supervising it	

The components of subsystem 1 in the budgeting process and its constraints and requirements will be as follows Table 7.

Table 7. The components of system 1 and its constraints and requirements.

Operational unit	Operational unit management	Dedicated environment	System 2 for each operational unit
OU1	Management of the provincial plan and budget organization.	Environment components introduced in the environment section.	All system components 2.
OU2	Management of executive agencies.		
OU3	Board of directors of state-owned companies.		
OU4	Head of the country plan and budget		

	organization.		

At this stage were examined performance evaluation indicators such as schedule, compliance with rules and regulations and compliance with regulatory departments.

According to the studies and the opinion of experts in this field, there are shortcomings and problems regarding the performance of system 1 components, which are listed in Table 7 in this section.

Study system 2 of system in focus:

The most important potential sources of conflict in the budgeting process are:

- Lack of attention to upstream laws and documents.
- Lack of attention to regulations, bylaws, instructions, approvals, standards, etc.
- Not paying attention to time tables and not observing the time limits set for each activity.

Therefore, the components of system 2 to coordinate and reduce conflict levels in the budgeting process are as Table 8.

System 2 components in the budgeting process

Twenty-year vision document of the Islamic Republic of Iran:

- Cabinet regulations and instructions.
- Budget circular.
- Budget law and its notes.
- Five-year economic development plan law.
- Budget agreement between the plan and budget organization and executive agencies.
- Budget execution rules.
- Performance reports of executive devices.
- Report of the research center of parliament.
- Budget deduction report.

Based on the studies, the components of subsystem 2 are considered as a flow, to facilitate the process of work and to establish order and integration in the use of resources and prevent illegal spending. However, according to experts, some generalizations and ambiguities in the relevant laws and regulations, as well as the multiplicity of laws, cause inconsistencies in implementation between operational units and create problems for evaluation by regulatory bodies. Therefore, this problem will be solved by revision of the rules and regulations in the field of budgeting.

Study system 3 of system in focus

In the study of this subsystem, it was found that in the budgeting process, the plan and budget organization of the country and the provinces, the ministry of economy and finance and the parliament play roles related to subsystem 3:

- Responsible for all activities related to inside of the system through communication with all related agencies.
- Responsibility to control the system 1 and ensure its performance.
- Communicating the approvals of system 5 to all executive bodies and provincial units.
- Check the results of monitoring performed within the 3^* system and take action if necessary.

- Approving the predicted processes to increase the level of coordination in the system (2) and notifying it to all executive agencies.
- Continuous monitoring of the implementation of programs and budgets and their annual periodic progress and submission of necessary reports.
- Responding to the system 5.

Allocation of resources to the executive bodies according to the approvals of the council of ministers and the parliament

Regarding the manner of exercising authority, the components of system 1 are required to carry out activities in accordance with the instructions and directives issued by systems 3 and 5. Bargaining over resources between components of system 1 is done both at the formulating stage and at the budget approval stage by executives. The performance of the components of system 3 in achieving the objectives is measured according to the monitoring performed by system 3* and the compliance of the operations of system 1 with the general programs and policies communicated by system 3 and 5.

Study system (3*) of system in focus

The monitoring process is carried out in three ways before, during and after spending by the supervisory departments, including the court of audit, the ministry of economy and finance, and the supervisory departments of the plan and budget organization and the parliament. Ambiguities in the law and non-distribution of credits based on performance, create problems in terms of supervision.

Study system 4 of system in focus

The activities of system 4 and the responsibility in the budgeting system are as Table 8.

Table 8. The activities of system 4 and the relevant responsibility.

Activities of system 4	Relevant officials
Strategic planning.	The country's plan and budget organization.
Research in the field of modern method of planning, budgeting and modeling.	Development and foresight research center of the national planning and budget organization. Parliamentary research center.
Study in the field of land management, development and regional balance.	Development and foresight research center of the national planning and budget organization.
Studies in development, financing and international economics.	Training, research and planning center of the tax affairs organization of the country. Macroeconomic affairs office of the national planning and budget organization.
Research in the field of development of sectoral affairs and environment.	Development and foresight research center of the national planning and budget organization.
Studies related to the future and new technologies.	Development and foresight research center of the national planning and budget organization.

Regarding the attention and compatibility of system 4 with the future, environment, strategic planning, development and financing, as well as new systems and new technologies, we can mention the tasks of the independent units mentioned in the table above. Related performance appraisal can also be done in all aspects.

Study system 5 of system in focus

Regarding the quality of system 5 performance, the following issues are raised.

Each of the subsystems performs a number of related tasks, which are from: Leadership institution, council of ministers, parliament, economic council and budget headquarters.

Budget policies should be developed and communicated in line with upstream laws and documents, including the five-year development plan law, the supreme leader's communicative policies, and the general policies of the resistance economy. However, there is evidence, including the report of the parliamentary research center on the review of the budget bill, which some cases were contrary to the upstream documents.

From the point of view of the interviewees, the multiplicity of laws and legal contradictions leads to the lack of a proper budget policy and its proper implementation. The principle of budget comprehensiveness is not properly observed, and this causes parts of the budget to remain hidden. At present, the budget is not balanced and should be considered in the budget reform policy. In this regard, increasing the financial space, including identifying new tax capacities and strategies to prevent tax evasion, as well as changing to the performance budgeting can be effective.

Controlling information flows and repetitive errors

According to the surveys and the opinion of the interviewees, there is an error due to the unclear goals and also the lack of full implementation of performance based budgeting. Regarding the independence of the components of system 1, to the extent that budget discipline is not disrupted, is delegated. All the information flows mentioned in VSM, are also present in the system.

However, there are shortcomings in IF2 flows, *i.e.,* goals based on S1 performance, and IF4, *i.e.,* performance expected from the main activities (goals for S1 activities), which this problem will be solved with full implementation of performance based budgeting and elimination of ambiguities in budget rules and notes. IF1 and IF 38 information flows also need to be strengthened, and the participation of civil society and parliament in budgeting can be effective in this regard.

Diagnosis of communication channels

In the model of viable systems, 16 communication channels are considered for the viability of a system, all of which are present in the desired system.

According to the identification and diagnosis, the final model of the system is as Figure 5.

Figure 5. Viable system model in public budgeting.
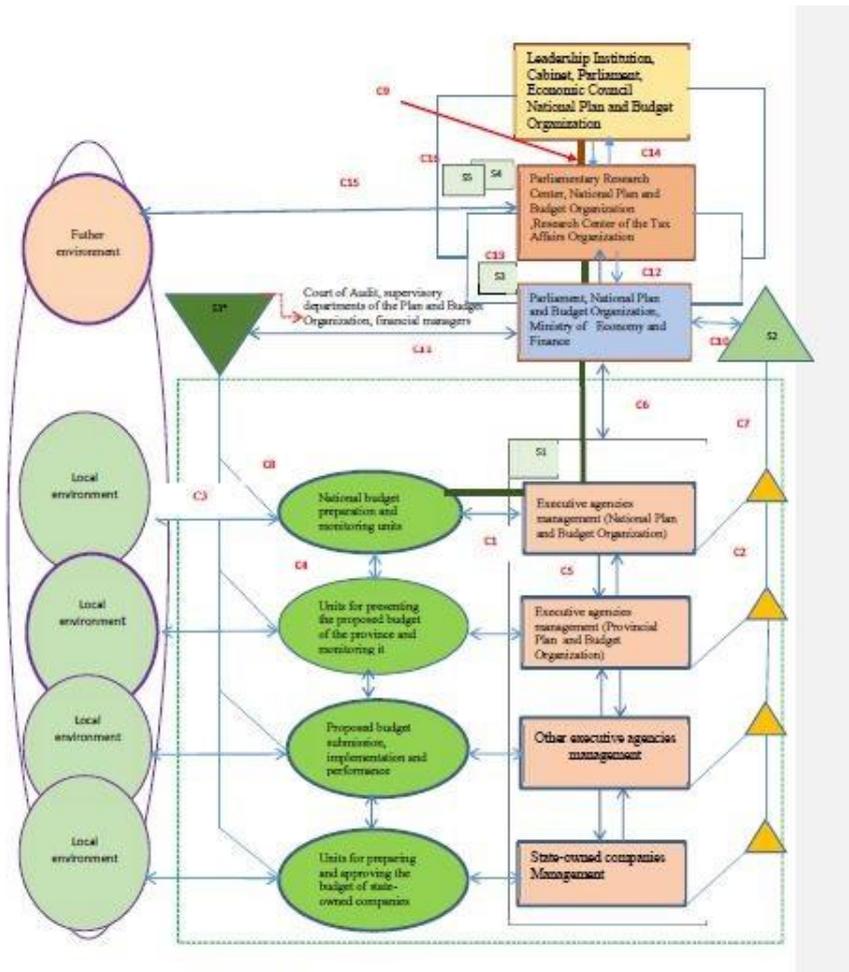
DISCUSSION

In this study, using the total systems interventions approach, three appropriate methodologies were selected and mixed to design a methodology. The mixed methodology designed to identify and diagnose the budgeting process in the public sector of Iran was used and the research findings eventually led to the presentation of a viable model for the system.

The results were also analyzed with the critical systems huristics methodology. Careful implementation of the steps of the designed mixed methodology led to the identification of weaknesses and problems of the system in order to survive. These results indicate that in order to achieve goals, should be eliminated the shortcomings related to the performance of each of the five subsystems and the features of good budgeting should be considered. The results and suggestions are as Table 9.

Table 9. Problems in the field of public budgeting and the solution.

Problems in the field of public budgeting	Explain	The solution	Related systems
Lack of proper infrastructure to implement performance based budgeting.	Inadequacy of manpower with government missions and economic instability affect the cost price.	Appropriate decisions to reduce inflation and maintain economic stability, improve human resource management practices and reform the structure of the executive agencies.	S1,S3 S5

Lack of serious attention to land management.	Budget allocation is not based on the capacity of the regions.	This criterion should be considered in the policy-making, formulating and approval stage of budgeting.	S1,S3 S5
Ambiguity and shortcomings of laws and regulations.	Generalization and the existence of contradictory rules.	Amend laws and develop clear indicators.	S3, S5
Organizational structure problems.	There is overlap in the tasks of some agencies.	Organizational structure reform.	S3, S5
Failure to comply with the principle of budget comprehensiveness.	Failure to include extra-budgetary resources and budgets of some agencies in the total budget.	Include all resources and projected costs in the total budget.	S1,S3, S5
Insufficient participation of stakeholders.	Lack of participation of civil society and councils in budgeting.	Establish mechanisms to increase participation.	S1,S3, S5
Lack of improvement of business environment.	Insufficient resources, economic instability as well as currency shocks, long schedule of facilities, multiple directives and government debt to the private sector.	Eliminate barriers to law enforcement Improving the business environment.	S1,S3, S5
Lack of full alignment of government policies with strategic planning and upstream documents.	There are some discrepancies in Budget bill with upstream documents.	Observance of upstream documents in the budgeting process.	S1,S3,S4, S5
Lack of transparency and budget discipline.	Ambiguities and generalization of budget rules and notes.	Amend the rules.	S3, S5
Time-consuming review of budget notes and allocating less time to the budget bill.	Existence of some notes overlapping with other rules.	Remove notes that overlap with other rules.	S3, S5
Budget deficit and unbalanced budget	Part of the current government expenditures is determined from the place of transfer of capital assets turns.	Reform the tax system and remove obstacles to the implementation of performance-based budgeting.	S3, S5

Answering research questions

According to the results of the diagnosis of the budgeting system based on the opinion of experts, reviewing the reports of regulatory bodies in this field (such as the report of the budget deduction and the report of budget bills) and also aligning their views on the components of good budgeting with theoretical literature, the components of good budgeting were determined at each stage of the budgeting process (Table 10).

Table 10. The components of good budgeting.

Stages of budgeting	Components of good budgeting in the public sector of Iran
Stage of policy making	Setting of the realistic and clear goals.
	Foresight in budget policies.
	Specify indicators in the rules of the five years development plans and the budget law.
	Verifying laws, regulations and procedures to improve transparency and accountability and enact new laws in cases of legal deficiency.
	Aligning budget with strategic planning.
	Aligning the budget with the government's macro policies in order to ensure budget effectiveness and discipline.

	Regard to budget principles, including the principle of comprehensiveness and inclusion of extra-budgetary resources in the budget bill.
	Independence of oil revenues.
	Coordination of monetary and fiscal policies.
	Fairly allocation of resources.
	Emphasis on improving the business environment.
	Adaptability to environmental changes.
	Increasing the involvement of executives, civil society and councils in budget policy making.
	Increasing the financial space and reforming the tax system.
	Considering the income that result of asset management in the revenue section.
	Decreasing the government debt.
	Reforming the budget structure.
	Improve the operating balance deficit.
Stage of budget preparation	Apply performance-based budgeting.
	Land use planning.
	Apply a medium-term cost framework.
	Limit political interference and organizational bargaining.
	Participation of staff, executives and councils in the preparation of the proposed budget.
	Considering upstream documents in budget preparation.
	Use the budget circular and schedule.
	Calculate the cost price of products and services.
	Regional and sectoral balance.
Stage of budget approval	Use a proper schedule in submitting the budget to the parliament.
	Free access to relevant and appropriate.
	Information by the parliament.
	Use the strong and capable specialized committees in the parliament.
	Limit political interference and organizational bargaining.
	More interaction between parliament and government.
	Justice in budget approvals.
	Eliminate some provisions of the budget law that overlap with other laws and remove non-performing budget provisions.
	Careful review of profits and resources of state owned companies.
	Obliging the government to pay attention to the principle of comprehensiveness in the budget by the parliament, including the inclusion of the budget of public institutions in the budget.
Stages of budget execution	Ability to cope with changes in the macroeconomic environment.
	Improve government structure to reduce running costs.
	Consider discipline in budget execution.
	Increase managerial authority and resource flexibility.
	Changes in organizational culture.
	Changes in human resource management practices and the proportion of human resources to government missions (quantitative and qualitative).
	Improving the process of training and development of human resources.
	Strengthen purchasing systems for transparency and efficiency.
	Support for accounting information systems.
	Accountability for performance.
	Create incentives for effective implementation.

	Cost control that requires effective internal systems and internal audits.
	Reduce any risk of abuse and corruption.
	Strengthening IT infrastructure.
	Accurate execution of the program and budget law regarding the budget repayment of for-profit projects.
Stages of oversight on budget	Paying attention to international standards.
	Identify legal deficiencies in monitoring and propose new laws.
	Timely submission of reports on the performance of executive bodies to the parliament.
	Improve internal control mechanisms and oversight processes in budget execution.
	Easy access of these organizations to the information of the executive departments.
	Use advisory committees and receive feedback from civil society to strengthen practices.
	Focus on consequences.
	In program evaluation.
	Functional audit of budget provisions.

Validation of the model and research results

In this research, have been used systemic approaches and methodologies and soft operations research including Total systems interventions approach, viable system model, critical systems huristics and soft systems methodology.

Validation in system methodologies is always a challenge. According to mingers, these methods are structured and accurate but non-mathematical. The credibility of these methods depends more on their ability to communicate with stakeholders and accept employers, help create new insights and attitudes, adapt to the real system, improve understanding and generally influence their audience.

In other words, the more we move towards soft system methodologies, the more the validation of these models will depend on the opinion of the stakeholders and the relevant employer. In soft operations research, to confirm the validity of the model, it is better to check whether the model is defensible in terms of coherence, and logically consistent and reasonable or not? In the present study, the validity of the final model obtained in the general budgeting process can be confirmed by the following ways:

- In the first stage, the mixed methodology that designed based on the total systems interventions approach, were approved of adaptation to theoretical foundations, metaphorical and paradigm analysis based on the SOSM table and the opinion of experts in the field of budgeting and system thinking.

- Before using the methodology, its validity was approved in terms of the requirements of the public budgeting system based on the opinions of experts in this field and in terms of covering all the requirements of viability.

- Considering that the methodologies used to identify and diagnose the budgeting process in the present study, are part of problem solving approaches or soft modelling, so to validate the model, the requirements of these approaches should also be met.

As mentioned above, the basis of validation in soft approaches is in their ability to communicate with stakeholders and accept employers, help create new insights and attitudes, adapt to the real system, improve understanding, and influence the audience and so on. And the defensibility of the model is that during the evaluations of the researcher and the interviewees who have been selected from the stakeholders involved in the issue, the mentioned requirements have been met to the desired level.

- The fulfilment of the VSM requirements in the mentioned model is also approved by adapting the model to the requirements of the budgeting system in the research literature and related documents and laws.
- Diagnosis results based on this model, extracting the shortcomings of the public budgeting system in Iran and good budgeting components, have been approved by experts in this field and in some way have been emphasized in the research literature, including the guidelines of international organizations And comparative studies in the field of budgeting in OECD member countries with a high ranking in good governance, the reports of the Parliamentary Research Center on the review of the budget bill, as well as the report of the budget deduction.

CONCLUSION

The purpose of this study is to design a good budgeting model in the public sector of Iran with using the total systems interventions approach. For this purpose, first Morgan's nine paradigms and metaphors were studied based on the SOSM table.

Then, based on two dimensions of the problem, *i.e.,* the degree of complexity and the degree of purpose of the stakeholders and also the purpose of the research, appropriate methodologies such as VSM, SSM, CSH were selected at each stage of the budgeting process and after mixing them, the proposed research methodology was presented. The mixed methodology was designed based on the above three methodologies and theoretical foundations related to the viable system model and the budgeting process. The steps of this methodology are in accordance with all the requirements related to the viable system model and the requirements of the public budgeting process.

In the second step, a mixed methodology was used to identify and diagnosis of the budgeting process in the public sector of Iran and the research findings led to the presentation of a viable model for the system Figure 5. The results were also analyzed with the model of critical systems heuristics. Accurate implementation of the designed mixed methodology steps leads to determining the weaknesses and problems of the system Table 10 and finally determining the components of good budgeting at each stage of the budgeting process Table 10.

These results indicate that in order to achieve goals of research, the shortcomings related to the performance of each of the five subsystems of system in focus should be eliminated and the features of good budgeting should be considered. The mixed methodology designed for the first time has been used for the diagnosis of the public budgeting process in Iran.

For future research, this methodology can be used in the diagnosis of systems and other processes, including budgeting at the organization level or in other geographical environments. Also, considering that the application of the Total systems interventions approach is to help the researcher to select appropriate methodologies. In future research, this approach can be used to identify other methodologies and develop them in the field of budgeting. Providing solutions to address the identified shortcomings in the field of budgeting can also be considered in future research.

ETHICAL APPROVAL

The authors of this article certify that:

- We have read and approved the final version of the manuscript.
- We have made substantial contributions to the submitted work, which may include study design, data acquisition and/or analysis, and data interpretation.

- We have made significant contributions to the preparation of the manuscript and/or critical revisions for important intellectual content.
- We will be accountable for all aspects of the submitted work.
- We agree to help investigate and resolve any issues/questions that may arise regarding the accuracy and integrity of the submitted work.

AUTHORS' CONTRIBUTIONS

We certify that all individuals who have made specific contributions to this manuscript but who do not fulfil the authorship criteria are listed with their specific contributions in the acknowledgments section of the manuscript.

FUNDING

Not applicable.

AVAILABILITY OF DATA AND MATERIALS

We understand that if necessary, the editor-in-systemic practice and action research or designate may request deidentified data that has been submitted as part of the manuscript. In this event, we agree to give access to the data.

We certify that this manuscript is not under consideration for publication in any other journal, nor has it been accepted for publication in any form, and no rights have been assigned to a third party.

AUTHOR CONTRIBUTIONS STATEMENT

- Leila Mirzadeh: PhD thesis.
- Mohsen Ghavamipour: Performer of the interviews and also, editor of the English version of the paper.

REFERENCES

1. Arghand AA, et al. Viable IT risk management system by Viable System Model (VSM): Action research for managing IT-related Risk in the banking service. Syst Pract Action Res. 2022;35:747-763.
2. Assimakopoulos NA, et al. A systemic approach for an open internet billing system. Department of Informatics, University of Piraeu. Piraeus, Greece. 2015.
3. Caiden N, et al. Budgeting in poor countries: Ten common assumptions re-examined. Public Adm Rev. 1980;40:40-46.
4. Caiden N, et al. Challenges confronting contemporary public budgeting: retrospectives/prospectives from Allen Schick. Public Adm Rev. 2010;70:203-210.
5. Chaudhry IS, et al. Viable system model: A tool for managing sustainable development holistically. Manag Sustain. 2022.
6. Egbide BC, et al. Good budgeting and good governance: A comparative discourse. Public Adm Rev. 2014.
7. Egbide BC, et al. The Impact of budget reforms on the quality of budget management in Nigeria. J Account Audit.

2014;1.

8. Flood RL, et al. Enhancing the process of methodology choice in Total Systems Intervention (TSI) and improving chances of tackling coercion. Syst Pract. 1995;8:377-408.

9. Hildbrand S, et al. Guidance on applying the viable system model. Kybernetes. 2015.

10. Midgley G, et al. Developing the methodology of TSI: From the oblique use of methods to creative design. Syst Pract. 1997;10:305-319.

11. Preece G, et al. Information management for viable organisations. Doctoral dissertation, Aston University. 2011.

12. Reynolds M, et al. Critical thinking and systems thinking: Towards a critical literacy for systems thinking in practice. Open Res. 2011.

13. Rezaee Z, et al. Application of viable system model in diagnosis of organizational structure. Syst Pract Action Res. 2019;32:273-295.

14. Rosenhead J, et al. Rational analysis for a problematic world revisited. Chichester, John Wiley and Sons. England. 2001.

15. Shah A, et al. Budgeting and budgetary institutions. Washington DC, World Bank Publications. USA. 2007.

16. Tayib M, et al. Good budgeting practices in Malaysian public universities. J Finance Manag. 2005;3:41-51.

17. Ulrich W, et al. Operational research and critical systems thinking—an integrated perspective: Part 1: OR as applied systems thinking. J Oper Res Soc. 2012;63:1228-1247.

18. Uppatumwichian W, et al. Applying the viable system model in an MCS: Addressing relationships between ERP and budgeting. Atlanta, Association for Information Systems Publisher. Georgia. 2011.

19. Vik MB, et al. Systemic problem structuring in a complex hospital environment using viable system diagnosis—keeping the blood flowing. Syst Pract Action Res. 2022;35:203-226.

20. Williams B, et al. Systems concepts in action: A practitioner's toolkit. Stanford University Press. United States. 2010:336.