



Leveling the Components of Balanced Scorecard-Based Budgeting in Iran's Healthcare Sector Using the ISM–MICMAC Approach

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ABSTRACT

The primary objective of this study was to level the components of Balanced Scorecard-based budgeting in Iran's healthcare sector using the ISM–MICMAC approach, so that by establishing links among strategic objectives, budgeting processes, and performance evaluation, the efficiency and effectiveness of the financial system of healthcare centers can be enhanced. In terms of purpose, the present study was applied-developmental, and methodologically, it employed an exploratory mixed-methods design (qualitative–quantitative). In the qualitative phase, semi-structured interviews were conducted with 15 experts in the fields of healthcare and finance, and thematic analysis was used to extract the fundamental dimensions and components of the model. In the quantitative phase, Interpretive Structural Modeling (ISM) revealed seven levels of relationships among the identified factors. At this stage, data were collected using an ISM questionnaire completed by 15 executive and academic experts. Within this structure, some factors were positioned at the foundational levels as principal drivers that create the conditions for influencing other factors, whereas others were located at higher levels and were more strongly affected by other variables. According to the findings, factors such as the development of human capacities, strengthening of information infrastructures, and establishment of organizational learning platforms were positioned at the foundational levels and played an important role in shaping and reinforcing the other dimensions of the model. In contrast, factors such as improving data-driven decision-making and enhancing the efficiency of organizational processes were located at higher levels of the model and primarily emerged as outcomes of strengthening the foundational factors. The findings indicate that the simultaneous strengthening of human capital, information technology infrastructure, and an organizational learning culture can facilitate the transition of the budgeting system from a purely financial approach toward a strategic and performance-oriented approach.

Keywords: budgeting, Balanced Scorecard, healthcare sector, efficiency and effectiveness of the financial system.

1. Introduction

Healthcare organizations operate within an increasingly complex environment characterized by rising service demand, rapid technological change, resource constraints, growing public expectations, and continuous pressure to improve quality, safety, accessibility, and financial sustainability. Hospitals and other healthcare institutions are therefore required to manage scarce financial resources while simultaneously maintaining clinical quality and responding to the expectations of patients, regulators, insurers, employees, and other stakeholders. Under such conditions, conventional budgeting systems that focus predominantly on expenditure control and short-term financial indicators may be insufficient for guiding organizational performance. Contemporary healthcare management increasingly requires budgeting mechanisms that connect resource allocation to strategic priorities, operational processes, organizational learning, service quality, and measurable outcomes. Accordingly, performance-oriented budgeting has gained importance as an approach through which financial planning can be linked to organizational objectives and accountability structures. Evidence from performance-based budgeting research indicates that standardizing performance indicators and explicitly connecting them with budgetary allocations can strengthen accountability, improve the consistency of resource allocation, and enhance the strategic orientation of financial management (1).

The limitations of traditional financial performance measurement are particularly evident in healthcare organizations because organizational success cannot be represented adequately by financial indicators alone. Financial sustainability remains essential, but hospitals must also consider patient satisfaction, clinical quality, safety, internal process efficiency, workforce capabilities, innovation, and organizational learning. The Balanced Scorecard (BSC) was developed precisely to overcome an excessive dependence on financial performance measures by providing a multidimensional framework that links financial objectives with customer-related outcomes, internal processes, and learning and growth. Within public and nonprofit settings, this multidimensional perspective is particularly important because organizational performance is shaped not only by profitability but also by service

delivery, public accountability, social value, and strategic mission. A review of BSC research in government entities has shown that the framework has become an important instrument for strategic performance management because it enables organizations to translate broad objectives into interconnected performance measures and to integrate financial and nonfinancial dimensions of performance (2). Thus, the BSC provides a potentially valuable foundation for redesigning budgeting systems in healthcare organizations around strategic and performance-related priorities.

The relevance of the Balanced Scorecard to healthcare has been demonstrated across a wide range of organizational contexts. Systematic examinations of BSC use in healthcare have shown that it has been adapted to different institutional environments and applied to strategic planning, performance assessment, quality improvement, and organizational control. Nevertheless, healthcare organizations differ considerably in their interpretation and operationalization of BSC perspectives, indicators, and causal relationships. A systematic literature review focusing on healthcare organizations in Italy, Spain, and Portugal demonstrated substantial variation in BSC design and implementation, while also confirming the framework's utility for integrating clinical, organizational, financial, and patient-related dimensions (3). Likewise, a broader scoping review of healthcare Balanced Scorecards found that their development and implementation involve diverse indicators and methodological approaches, indicating that the effectiveness of BSC systems depends strongly on contextual adaptation and careful alignment with organizational priorities (4). These findings suggest that healthcare organizations require context-specific models rather than direct replication of generic scorecards.

The financial perspective of the Balanced Scorecard is especially critical in healthcare because budgetary constraints directly affect staffing, technology acquisition, service capacity, infrastructure development, and access to care. Yet, financial performance should not be treated as an isolated endpoint. A more effective budgeting system should clarify how expenditures contribute to strategic results and how nonfinancial capacities ultimately influence financial efficiency. Recent research has increasingly emphasized the integration of budgeting and multidimensional performance measurement. For example, a model combining the

Balanced Scorecard with budgeting and multicriteria evaluation has illustrated the potential of integrating strategic perspectives with financial planning to produce a more comprehensive assessment of organizational performance (5). Such integration is particularly relevant for healthcare institutions, where expenditure decisions influence patient outcomes, operational efficiency, employee capabilities, and organizational resilience. Therefore, Balanced Scorecard-based budgeting can be conceptualized not merely as an accounting mechanism but as a strategic management architecture connecting resource allocation with multiple dimensions of organizational performance.

This strategic integration is also important because healthcare performance is inherently multidimensional. Financial indicators may reveal whether resources are being consumed efficiently, but they do not independently show whether patients are satisfied, clinical processes are safe, or organizational capabilities are improving. Studies aimed at identifying performance factors among healthcare providers have demonstrated that healthcare performance depends on a broad set of interrelated clinical, managerial, operational, and organizational criteria (6). Similarly, hospital-specific research has emphasized the importance of identifying and prioritizing Balanced Scorecard performance measures that reflect the distinctive operational characteristics of healthcare institutions rather than relying on generic organizational indicators (7). This need for sector-specific performance measures is highly relevant to budgeting because the quality of resource allocation depends on the extent to which the underlying indicators genuinely represent organizational priorities and operational realities.

The customer or patient perspective is another fundamental component of Balanced Scorecard-based budgeting in healthcare. Unlike many other service sectors, healthcare organizations must respond to patients whose experiences are influenced by clinical outcomes, waiting times, communication quality, perceived safety, accessibility, continuity of care, administrative processes, and trust in service providers. Consequently, patient-related performance indicators must be interpreted carefully and connected to broader organizational goals. Research on the use of the Net Promoter Score in healthcare, for example, has highlighted both the growing interest in patient-

experience metrics and the methodological limitations associated with relying on a single satisfaction indicator (8). From a budgeting perspective, this implies that patient-centered indicators should be incorporated into a multidimensional framework so that investments in service quality, accessibility, communication, and safety can be evaluated in relation to financial and operational outcomes rather than as isolated measures.

Internal processes are similarly central to the relationship between budgeting and performance. Healthcare organizations operate through highly interdependent clinical and administrative processes in which inefficiencies, duplication, delayed decision-making, weak information flows, and poor coordination can substantially increase costs. Performance management systems must therefore identify internal processes that create value and determine how budgetary resources can support their improvement. Experience with Balanced Scorecard-based performance evaluation in administrative and financial systems has shown that the implementation of electronic financial processes can alter performance across multiple scorecard dimensions, illustrating the importance of connecting financial modernization with organizational performance assessment (9). More broadly, integrated performance evaluation approaches that combine multiple management frameworks have demonstrated that organizational assessment is strengthened when different performance criteria are linked systematically rather than examined in isolation (10). In healthcare, this reinforces the need to view budgeting as part of an interconnected performance-management system in which financial decisions are linked with process redesign, service improvement, and strategic control.

Digital transformation has further increased the importance of integrating budgeting, information systems, and performance management. Healthcare organizations increasingly depend on electronic health records, hospital information systems, enterprise resource planning systems, business intelligence dashboards, digital monitoring technologies, and data analytics. These technologies can improve transparency, facilitate real-time performance monitoring, support evidence-based decisions, and strengthen the connection between operational information and financial management. Research on Healthcare 4.0 has

shown that the adoption of advanced digital technologies can influence hospital performance by transforming operational capabilities and supporting more integrated forms of management (11). More recent work on strategic resilience in healthcare has similarly argued for the development of a digitalized and regenerative Balanced Scorecard framework capable of incorporating resilience, digital capabilities, and long-term organizational sustainability into strategic performance management (12). These developments indicate that information infrastructure should be treated not as a peripheral technical resource but as an enabling factor that can shape budgeting quality, organizational responsiveness, and performance outcomes.

The learning and growth perspective of the Balanced Scorecard is equally important because effective budgeting systems depend on the capabilities of the individuals and organizational structures responsible for collecting data, interpreting indicators, allocating resources, and implementing strategic priorities. Human capital, leadership development, professional competencies, motivation systems, organizational learning, and innovation all influence whether a performance-based budgeting framework functions in practice. International experience has shown that the Balanced Scorecard can contribute to the efficiency of healthcare institutions when it is embedded in broader organizational practices rather than used solely as a reporting instrument (13). This perspective highlights an important principle: sustainable improvements in financial and operational performance often depend on investments in human and organizational capabilities. Accordingly, budgets should support not only immediate service delivery but also training, leadership development, knowledge management, innovation, and digital competence.

The strategic value of the Balanced Scorecard is particularly evident when it is embedded in governance and managerial decision-making. A scorecard-driven performance dashboard implemented in a public oncology center demonstrated how BSC indicators can support governance by translating organizational objectives into structured, monitorable performance information (14). Such applications are especially relevant for healthcare budgeting because governance requires managers to justify resource allocation decisions, demonstrate accountability, and monitor the consequences of financial choices across

multiple dimensions. When financial data, service indicators, patient outcomes, and organizational learning measures are integrated within a coherent dashboard, decision makers can move from retrospective expenditure control toward more proactive and strategic management.

Another important issue concerns the prioritization of performance indicators. Healthcare organizations often generate large volumes of financial and operational data, yet not all indicators have the same strategic importance. Therefore, managers need methods that can identify which factors are fundamental drivers, which function as intermediaries, and which mainly represent outcomes. Studies combining the Balanced Scorecard with multicriteria decision-making approaches have illustrated the usefulness of prioritizing performance dimensions and ranking organizational units on the basis of multidimensional criteria. For example, the application of the BSC together with the VIKOR method in performance evaluation demonstrates the potential value of integrating strategic performance frameworks with analytical techniques that support prioritization and comparative assessment (15). Similarly, research on asset maintenance performance has shown that Balanced Scorecard-based indicators can provide a structured basis for identifying and managing performance priorities across different organizational dimensions (16). These studies support the argument that the mere identification of indicators is insufficient; the relationships and relative influence among them must also be examined.

This issue becomes especially important in the budgeting context because components of organizational performance are rarely independent. Investments in information infrastructure may improve data quality; improved data quality may enhance decision-making; stronger decision-making may facilitate cost control; cost control may improve financial sustainability; and improved financial sustainability may enable further investments in human resources and service quality. Similarly, leadership development may strengthen organizational learning, while a learning culture can facilitate innovation and process improvement. The causal architecture of these relationships is therefore essential for determining which budgetary components should receive strategic priority. A purely descriptive Balanced Scorecard may reveal the status of

performance dimensions, but it may not identify the hierarchical influence structure through which those dimensions affect one another. For this reason, structural modeling methods can complement BSC-based performance frameworks by clarifying the direction and hierarchy of relationships among identified factors.

Interpretive Structural Modeling (ISM) is particularly suitable for this purpose because it enables a set of complex, interrelated variables to be organized into a hierarchical structure based on expert judgments regarding their pairwise relationships. Rather than treating all factors as equivalent, ISM can distinguish foundational drivers from intermediate mechanisms and higher-level outcomes. When combined with MICMAC analysis, which evaluates driving power and dependence, the resulting framework can further classify variables as autonomous, dependent, linkage, or driver factors. This combined approach provides a more analytically informative basis for strategic budgeting because it helps managers identify the variables whose improvement is most likely to produce cascading effects throughout the system. Such an approach is especially useful in healthcare, where multiple clinical, financial, operational, technological, and human-resource factors interact simultaneously.

The importance of this structural perspective is reinforced by contemporary concerns about resilience and organizational adaptability. Healthcare systems must respond not only to routine service pressures but also to demographic changes, technological disruption, unexpected demand shocks, inflationary pressures, workforce shortages, and changes in financing mechanisms. A strategically designed performance system should therefore identify the capabilities that enable organizations to adapt while protecting service quality and financial sustainability. Emerging Balanced Scorecard research has increasingly moved toward frameworks that incorporate resilience, digitalization, and regenerative organizational capacities (12). At the same time, evidence from public-sector BSC research suggests that successful implementation depends heavily on contextual adaptation, stakeholder involvement, institutional alignment, and the quality of performance information (2). Consequently, designing a budgeting model for healthcare requires attention not only to what should be

measured but also to how components are structurally interconnected within the specific institutional environment.

In Iran's healthcare sector, these considerations are particularly important because healthcare organizations must balance resource limitations with expectations for equitable access, high-quality services, financial accountability, technological modernization, and improved organizational efficiency. Budgeting decisions affect virtually every aspect of healthcare delivery, from staffing and medical equipment to information infrastructure and patient services. Nevertheless, when budgeting remains predominantly input-oriented and financially focused, the relationship between resource allocation and strategic performance may remain weak. Integrating the Balanced Scorecard into budgeting offers a mechanism for linking financial allocations with patient outcomes, internal processes, learning and growth, and strategic objectives. However, successful implementation requires identification of the most relevant components and clarification of the interdependencies among them.

The need for such integration is also evident from the diversity of existing BSC applications. Prior studies have demonstrated its usefulness in hospitals, public organizations, treasury and financial administration, asset maintenance, governance dashboards, and multidimensional performance evaluation (5, 7, 9, 14, 16). At the same time, methodological research emphasizes that performance frameworks are more effective when criteria are prioritized, integrated, and linked to decision-making mechanisms rather than merely reported descriptively (10). These findings point to a significant research need: a healthcare budgeting framework should not only specify relevant Balanced Scorecard dimensions but should also reveal which components exert the greatest structural influence and how they interact across the system.

Despite the expanding literature on Balanced Scorecard implementation in healthcare, several gaps remain. First, much of the existing research focuses on performance measurement rather than the explicit integration of budgeting with Balanced Scorecard perspectives. Second, many studies identify or rank indicators but do not examine the hierarchical causal relationships among them. Third, findings from other countries or sectors cannot necessarily be transferred directly to Iran's healthcare system because

institutional arrangements, financing mechanisms, governance structures, and organizational capacities differ across contexts. Fourth, the increasing role of digital infrastructure, data-driven management, organizational learning, and strategic resilience requires contemporary budgeting models to incorporate both traditional financial concerns and emerging managerial capabilities. These gaps justify the development of a context-specific model capable of linking strategic budgeting, multidimensional performance measurement, and structural analysis.

Accordingly, the present study aims to identify and level the components of Balanced Scorecard-based budgeting in Iran's healthcare sector and to analyze their driving and dependence relationships using the integrated ISM–MICMAC approach.

2. Methods and Materials

In terms of purpose, the present study was applied-developmental, and in terms of approach, it employed an exploratory mixed-methods design (qualitative–quantitative). The objective of the study was to identify and level the components affecting budgeting in Iran's healthcare sector based on the Balanced Scorecard and to explain the interrelationships among them. In the qualitative phase, to identify the main components, semi-structured interviews were conducted with 15 academic and executive experts in healthcare and financial management who were selected through purposive sampling. The data obtained from the semi-structured interviews were analyzed using thematic analysis, and after extracting, coding, and categorizing the themes, the main components of the model were identified.

In the quantitative phase, Interpretive Structural Modeling (ISM) was used to determine the interrelationships among the identified components and establish their hierarchical levels. For this purpose, an interpretive structural questionnaire was administered to the same 15 experts, and pairwise relationships among the components were determined based on their expert judgments. Subsequently, the Structural Self-Interaction Matrix was constructed, and after applying transitivity relationships, the final reachability matrix was obtained. The components were then classified into seven levels based on their

reachability and antecedent sets, and the hierarchical model of the study was developed.

In the final phase, MICMAC analysis was employed to determine the driving power and dependence power of each component. Accordingly, the components were classified into driver, dependent, linkage, and autonomous groups based on their roles within the budgeting system structure. Integrating the results of thematic analysis, ISM, and MICMAC made it possible to identify the foundational, intermediary, and outcome-related factors of Balanced Scorecard-based budgeting and provided the basis for developing an interpretive structural model of budgeting in Iran's healthcare sector.

3. Findings and Results

In this study, a total of 15 experts and university professors were interviewed, of whom 80% were male and 20% were female. In terms of work experience, 13.3% had 10–15 years of experience, 53.3% had 15–20 years of experience, and 33.3% had more than 20 years of experience. Regarding educational attainment, 86.7% held doctoral degrees or higher, and 13.3% held master's degrees. The interviews were conducted in Tehran, Shiraz, Isfahan, and Tabriz.

At this stage of the study, data were collected through in-depth, face-to-face interviews with the participants. During the interviews, participants were asked about their observations and experiences, and all conversations were recorded with their consent to enable repeated review, in-depth analysis, and more precise examination of their perspectives. The interview protocol consisted of six main questions and several questions related to the experts' demographic characteristics. Depending on each interviewee's response pattern, some supplementary questions were omitted or redesigned to facilitate the collection of clearer information.

In the first step, concepts and key points related to the research topic were extracted from the interview transcripts. These concepts were standardized through careful analysis by selecting more appropriate terminology and eliminating repetitive concepts, resulting in 100 initial codes. These codes were subsequently formulated as a checklist for the following interviews, and after further review with the experts, some items were deleted or revised.

In the second step, during the organizing-category stage, synonymous or related concepts were grouped into broader categories. A title was selected for each category based on concepts derived from relevant theories or concepts emerging from the data. During the organizing-category stage, synonymous or related concepts were grouped into broader categories. A title was selected for each category based on concepts derived from relevant theories or concepts emerging from the data. Accordingly, similar responses from the interviews were integrated, overlapping concepts were merged, and ultimately four main categories were formed.

Category One: Financial Perspective

Within the financial perspective of the Balanced Scorecard-based budgeting model in the healthcare industry, 25 basic themes were consolidated into five organizing clusters. First, “financial resource pressures and budget sustainability” addresses challenges such as limitations in government and insurance funding, increasing equipment prices, and budget deficits. Second, “financial transparency and regulatory accountability” emphasizes transparent reporting requirements, continuous auditing, and accountability to supervisory institutions. Third, “operational budgeting and alignment with macro-level policies” encompasses expenditure justification, compliance with government budgeting policies, the resistance economy, and national development programs. Fourth, “control and optimization of healthcare costs” focuses on managing direct and indirect costs, optimal resource allocation, and the use of cost-per-service indicators. Fifth, “data-driven financial management and effective investment” encompasses the use of performance data, real-time reports, trend analysis, increasing return on investment, and participation by insurance organizations and charitable donors to support more accurate and sustainable financial decision-making.

Category Two: Customer (Patient) Perspective

Within the customer (patient) perspective of the Balanced Scorecard-based budgeting model in the healthcare industry, the basic themes were organized around five main areas. First, “patient experience and satisfaction management” focuses on measuring and improving patient satisfaction throughout all stages of service delivery. Second, “accountability, communication, and trust-building with

patients” concerns the establishment of effective mechanisms for handling complaints, managerial accountability, and strengthening public trust in hospitals. Third, “standards-based quality and safety of healthcare services” emphasizes improving service quality, standardizing clinical pathways, and reducing errors and disease recurrence. Fourth, “equitable access and facilitation of service delivery” seeks to improve patient access, enhance cost transparency, and reduce administrative barriers to receiving services. Fifth, “service development and adaptation to healthcare market changes” addresses hospital competitiveness, the expansion of health tourism, changes in healthcare demand patterns, and the use of emerging technologies to respond more effectively to patients’ needs.

Category Three: Internal Process Perspective

Within the internal process perspective of the Balanced Scorecard in the healthcare industry, the themes were organized into five main networks. First, “integration and intelligentization of information infrastructures” focuses on the development of electronic health records, Hospital Information Systems (HIS), Enterprise Resource Planning (ERP) systems, management dashboards, and information security to support accurate and real-time decision-making. Second, “organizational restructuring and agility enhancement” seeks to increase organizational flexibility by revising organizational structures, eliminating overlapping responsibilities, simplifying decision-making, and redesigning processes. Third, “quality and safety management and reduction of operational errors” encompasses improvements in patient safety, reduction of rework, and implementation of quality management systems. Fourth, “enhancement of service productivity and operational efficiency” aims to reduce service delivery time, eliminate repetitive procedures, and optimize the utilization of resources and equipment. Fifth, “performance-based monitoring, evaluation, and decision-making” establishes the foundation for an organizational performance monitoring system through supervisory committees, analysis of quantitative indicators, and forecasting of future needs.

Category Four: Learning and Growth Perspective

Within the learning and growth perspective of the Balanced Scorecard in the healthcare industry, the themes were organized into five main networks. First, “educational

empowerment and development of professional competencies” focuses on enhancing employees’ specialized, managerial, and financial skills through targeted training and continuous retraining. Second, “leadership development and career progression pathways” addresses the strengthening of managerial competencies, development of transparent career paths, and implementation of mentoring systems. Third, “employee performance management and motivation system” provides the foundation for improving workforce productivity through the definition of key performance indicators, reward systems, and continuous feedback. Fourth, “institutionalization of an organizational learning and innovation culture” emphasizes using employee ideas and suggestion systems to support continuous improvement. Fifth, “alignment of learning with strategy and digital

transformation” directs organizational learning toward the achievement of hospitals’ overarching objectives through the formulation of strategy maps, linking budgetary objectives with the organizational mission, and using the Balanced Scorecard and business intelligence dashboards.

In the third step, categorization was conducted based on the thematic network, whereby homogeneous and overlapping categories were grouped into broader categories according to their conceptual commonalities. Subsequently, Table 1 was developed to present the initial concepts and categories, and the concepts were abstracted at a higher level to derive the main themes of the study. Finally, related categories were classified under an overarching theme, and final titles were assigned to each theme according to the theoretical framework and research literature.

Table 1

Final Categories of the Thematic Network Model

Thematic Network	Organizing Category	Global Category
Financial resource pressures and budget sustainability	Financial perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Accountability, transparency, and financial discipline	Financial perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Alignment of budgeting with operational programs	Financial perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Cost management and resource optimization	Financial perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Data- and performance-driven financial management	Financial perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Patient experience and satisfaction	Customer (patient) perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Accountability and public trust-building	Customer (patient) perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Service quality and patient safety	Customer (patient) perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Equitable access and service facilitation	Customer (patient) perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Innovation and adaptation to community needs	Customer (patient) perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Integration and intelligentization of information infrastructures	Internal process perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Organizational restructuring and agility enhancement	Internal process perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Quality management and operational safety	Internal process perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Enhancement of service productivity and efficiency	Internal process perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Performance-based monitoring, evaluation, and decision-making	Internal process perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Educational empowerment and competency development	Learning and growth perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector
Leadership development and career progression pathways	Learning and growth perspective	Balanced Scorecard-based budgeting model for Iran’s healthcare sector

Employee performance management and motivation system	Learning and growth perspective	Balanced Scorecard-based budgeting model for Iran's healthcare sector
Organizational learning and innovation culture	Learning and growth perspective	Balanced Scorecard-based budgeting model for Iran's healthcare sector
Strategic alignment and digital transformation	Learning and growth perspective	Balanced Scorecard-based budgeting model for Iran's healthcare sector

At this stage, the descriptive characteristics of the experts are presented in Table 2.

Table 2

Characteristics of the Expert Panel

No.	Gender	Age Range	Education	Field of Activity	Work Experience
1	Female	25–30	Master's degree	Healthcare	10 years
2	Male	25–30	Master's degree	Healthcare	10 years
3	Male	31–40	Doctorate	University	10 years
4	Male	31–40	Doctorate	University	10–15 years
5	Male	31–40	Doctorate	Healthcare	10 years
6	Male	31–40	Doctorate	Healthcare and university	10–15 years
7	Female	31–40	Doctorate	University	10 years
8	Male	41–50	Doctorate	University	15–20 years
9	Male	41–50	Master's degree	Healthcare	15–20 years
10	Male	41–50	Doctorate	Healthcare and university	10–15 years
11	Male	41–50	Doctorate	Healthcare	15–20 years
12	Female	41–50	Doctorate	University	15–20 years
13	Male	51–60	Doctorate	University	More than 20 years
14	Male	51–60	Master's degree	Healthcare	More than 20 years
15	Male	51–60	Doctorate	Healthcare and university	More than 20 years

Among the 15 experts participating in the study, 12 (80%) were male and 3 (20%) were female. In terms of age, the largest proportions of experts were in the 31–40 and 41–50 age groups. Furthermore, 12 participants (80%) held doctoral degrees and 3 (20%) held master's degrees. The experts were selected from university and healthcare settings, and their work experience ranged from 10 years to more than 20 years. Overall, the composition of the expert panel in terms of educational attainment, professional experience, and diversity of fields of activity was considered appropriate for developing and validating the interpretive structural model of budgeting in the healthcare sector.

Step 1. Consolidation of Expert Opinions Regarding Relationships Among Variables

At this stage, because an interpretive structural questionnaire was used, the experts were invited to participate in a brainstorming session to answer the questions and exchange information. After the questionnaires were collected, the experts' opinions were aggregated. Aggregation was performed based on the frequency of responses. The experts used four symbols to

determine the relationship between each pair of sub-processes. Each symbol has a specific meaning:

1. **V (forward relationship)** indicates that factor a is a prerequisite for factor b . The output of a serves as an input to b .
2. **A (backward relationship)** indicates that factor a is dependent on factor b as a subsequent requirement. Factor a receives its input from b .
3. **X (bidirectional relationship)** indicates that factors a and b are mutually dependent. They provide inputs and outputs to one another.
4. **O (no relationship)** indicates that factor a and factor b are unrelated. Neither a nor b provides an input to the other.

Step 2. Formation of the Reachability Matrix

The reachability matrix can be developed by converting the relationship symbols in the matrix into binary values of zero and one according to the following rules: (a) if cell (i, j) in the matrix contains the symbol V, the corresponding cell in the reachability matrix receives a value of 1, whereas its symmetrical cell, (j, i) , receives a value of 0; (b) if cell (i, j)

contains the symbol A, the corresponding cell in the reachability matrix receives a value of 0, whereas the symmetrical cell, (j, i) , receives a value of 1; (c) if cell (i, j) contains the symbol X, both the corresponding cell and its symmetrical cell, (j, i) , receive values of 1; and (d) if cell (i, j) contains the symbol O, both the corresponding cell and its symmetrical cell, (j, i) , receive values of 0.

Step 3. Formation of the Final Reachability Matrix

After obtaining the initial reachability matrix, its internal consistency must be established. For example, if Variable 1 leads to Variable 2 and Variable 2 leads to Variable 3, then Variable 1 must also lead to Variable 3. If this condition is not reflected in the reachability matrix, the matrix must be corrected and the omitted relationships added. In the final matrix, such corrections are denoted by 1*.

Step 4. Determination of Model Levels

After calculating the final reachability matrix, the levels of the model must be determined. Accordingly, the input and output sets for each factor are identified. If the output set and the calculated intersection set are identical, the corresponding factor belongs to that level. Otherwise, it must be transferred to the next level. The results of the factor-leveling process are presented below.

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Table 3

Determination of Level 1 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1, 2, 3, 4, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 7, 9	1, 2, 3, 7	
Accountability, transparency, and financial discipline	1, 2, 4, 8, 10, 11, 15, 16, 17, 18, 19, 20	1, 2, 5, 6, 7, 8, 9, 10, 15, 16, 17	1, 2, 8, 10, 15, 16, 17	
Alignment of budgeting with operational programs	1, 3, 4, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	1, 3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19	
Cost management and resource optimization	3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19	
Data- and performance-driven financial management	2, 3, 5, 6, 7, 8, 9, 10, 11, 13, 15, 16, 17, 18, 19, 20	4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 18, 19	5, 6, 7, 9, 10, 11, 13, 15, 18, 19	
Patient experience and satisfaction	2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 3, 4, 5, 6, 7, 9, 10, 13, 14, 15	3, 4, 5, 6, 7, 9, 10, 13, 14, 15	
Accountability and public trust-building	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	
Service quality and patient safety	2, 8	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	2, 8	1
Equitable access and service facilitation	1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	5, 6, 7, 9	5, 6, 7, 9	
Innovation and adaptation to community needs	2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19, 20	
Integration and intelligentization of information infrastructures	3, 4, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19, 20	
Organizational restructuring and agility enhancement	3, 4, 5, 7, 8, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	7, 9, 12	7, 12	
Quality management and operational safety	3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	
Enhancement of service productivity and efficiency	3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	
Performance-based monitoring, evaluation, and decision-making	2, 3, 4, 5, 6, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	
Educational empowerment and competency development	2, 3, 4, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20	2, 3, 4, 7, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	
Leadership development and career progression pathways	2, 3, 4, 16, 17	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19	2, 3, 4, 16, 17	1
Employee performance management and motivation system	3, 4, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	

Organizational learning and innovation culture	3, 4, 5, 7, 8, 10, 11, 13, 14, 15, 16, 17, 18, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19, 20	
Strategic alignment and digital transformation	7, 10, 11, 16, 19, 20	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19, 20	7, 10, 11, 16, 19, 20	1

According to the results, three factors were identified as belonging to Level 1, representing the final level of influence. Accordingly, these three factors were removed from subsequent calculations, and further calculations were

conducted without them. These factors were “service quality and patient safety,” “leadership development and career progression pathways,” and “strategic alignment and digital transformation.”

Table 4

Determination of Level 2 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1, 2, 3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 7, 9	1, 2, 3, 7	
Accountability, transparency, and financial discipline	1, 2, 4, 10, 11, 15, 16, 18, 19	1, 2, 5, 6, 7, 9, 10, 15, 16	1, 2, 10, 15, 16	
Alignment of budgeting with operational programs	1, 3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	1, 3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Cost management and resource optimization	3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Data- and performance-driven financial management	2, 3, 5, 6, 7, 9, 10, 11, 13, 15, 16, 18, 19	4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 18, 19	5, 6, 7, 9, 10, 11, 13, 15, 18, 19	
Patient experience and satisfaction	2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 14, 15, 16, 18, 19	1, 3, 4, 5, 6, 7, 9, 10, 13, 14, 15	3, 4, 5, 6, 7, 9, 10, 13, 14, 15	
Accountability and public trust-building	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	
Equitable access and service facilitation	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	5, 6, 7, 9	5, 6, 7, 9	
Innovation and adaptation to community needs	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Integration and intelligentization of information infrastructures	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Organizational restructuring and agility enhancement	3, 4, 5, 7, 10, 11, 12, 13, 14, 15, 16, 18, 19	7, 9, 12	7, 12	
Quality management and operational safety	3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Enhancement of service productivity and efficiency	3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 3, 4, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	
Performance-based monitoring, evaluation, and decision-making	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	2, 3, 4, 5, 6, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Educational empowerment and competency development	2, 3, 4, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	2, 3, 4, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Employee performance management and motivation system	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	2
Organizational learning and innovation culture	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 12, 13, 14, 15, 16, 18, 19	3, 4, 5, 7, 10, 11, 13, 14, 15, 16, 18, 19	2

According to the results, nine factors were identified as belonging to Level 2: “innovation and adaptation to community needs,” “integration and intelligentization of information infrastructures,” “quality management and operational safety,” “performance-based monitoring,

evaluation, and decision-making,” “educational empowerment and competency development,” “employee performance management and motivation system,” and “organizational learning and innovation culture.”

Table 5
Determination of Level 3 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1, 2, 6, 7, 14	1, 2, 7, 9	1, 2, 7	3
Accountability, transparency, and financial discipline	1, 2	1, 2, 5, 6, 7, 9	1, 2	
Data- and performance-driven financial management	2, 5, 6, 7, 9	5, 6, 7, 9, 12, 14	5, 6, 7, 9	
Patient experience and satisfaction	2, 5, 6, 7, 9, 14	1, 5, 6, 7, 9, 14	5, 6, 7, 9, 14	
Accountability and public trust-building	1, 2, 5, 6, 7, 9, 12, 14	1, 5, 6, 7, 9, 12, 14	1, 5, 6, 7, 9, 12, 14	
Equitable access and service facilitation	1, 2, 5, 6, 7, 9, 12, 14	5, 6, 7, 9	5, 6, 7, 9	
Organizational restructuring and agility enhancement	5, 7, 12, 14	7, 9, 12	7, 12	
Enhancement of service productivity and efficiency	5, 6, 7, 14	1, 6, 7, 9, 12, 14	6, 7, 14	

The only factor belonging to Level 3 was “accountability, transparency, and financial discipline.”

Table 6
Determination of Level 4 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1, 6, 7, 14	1, 7, 9	1, 7	4
Organizational restructuring and agility enhancement	5, 6, 7, 9	5, 6, 7, 9, 12, 14	5, 6, 7, 9	
Patient experience and satisfaction	5, 6, 7, 9, 14	1, 5, 6, 7, 9, 14	5, 6, 7, 9, 14	
Accountability and public trust-building	1, 5, 6, 7, 9, 12, 14	1, 5, 6, 7, 9, 12, 14	1, 5, 6, 7, 9, 12, 14	
Equitable access and service facilitation	1, 5, 6, 7, 9, 12, 14	5, 6, 7, 9	5, 6, 7, 9	
Data- and performance-driven financial management	5, 7, 12, 14	7, 9, 12	7, 12	
Enhancement of service productivity and efficiency	5, 6, 7, 14	1, 6, 7, 9, 12, 14	6, 7, 14	

The above table indicates that three factors belong to Level 4 of influence. Accordingly, these three factors were removed from subsequent calculations. These factors were

“organizational restructuring and agility enhancement,” “patient experience and satisfaction,” and “accountability and public trust-building.”

Table 7
Determination of Level 5 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1, 14	1, 9	1	5
Equitable access and service facilitation	14	1, 9, 12, 14	14	
Data- and performance-driven financial management	12, 14	9, 12	12	
Enhancement of service productivity and efficiency	1, 9, 12, 14	9	9	

The only factor belonging to Level 5 was “equitable access and service facilitation.”

Table 8
Determination of Level 6 Factors

Factors	Reachability Set	Antecedent Set	Intersection Set	Level
Financial resource pressures and budget sustainability	1	1, 9	1	6
Data- and performance-driven financial management	1, 9, 12	9	9	7
Enhancement of service productivity and efficiency	12	9, 12	12	6

The remaining factors belonged to the final two levels, Levels 6 and 7. At Level 6, the two factors were “financial resource pressures and budget sustainability” and “enhancement of service productivity and efficiency.” The only factor at Level 7, representing the most influential level, was “data- and performance-driven financial management.” Accordingly, all identified factors were assigned to the seven hierarchical levels.

Step 5. Development of the Interpretive Structural Model of Balanced Scorecard-Based Budgeting in Iran’s Healthcare Sector

Based on the results of the analysis of influence levels, the identified factors were classified into seven levels.

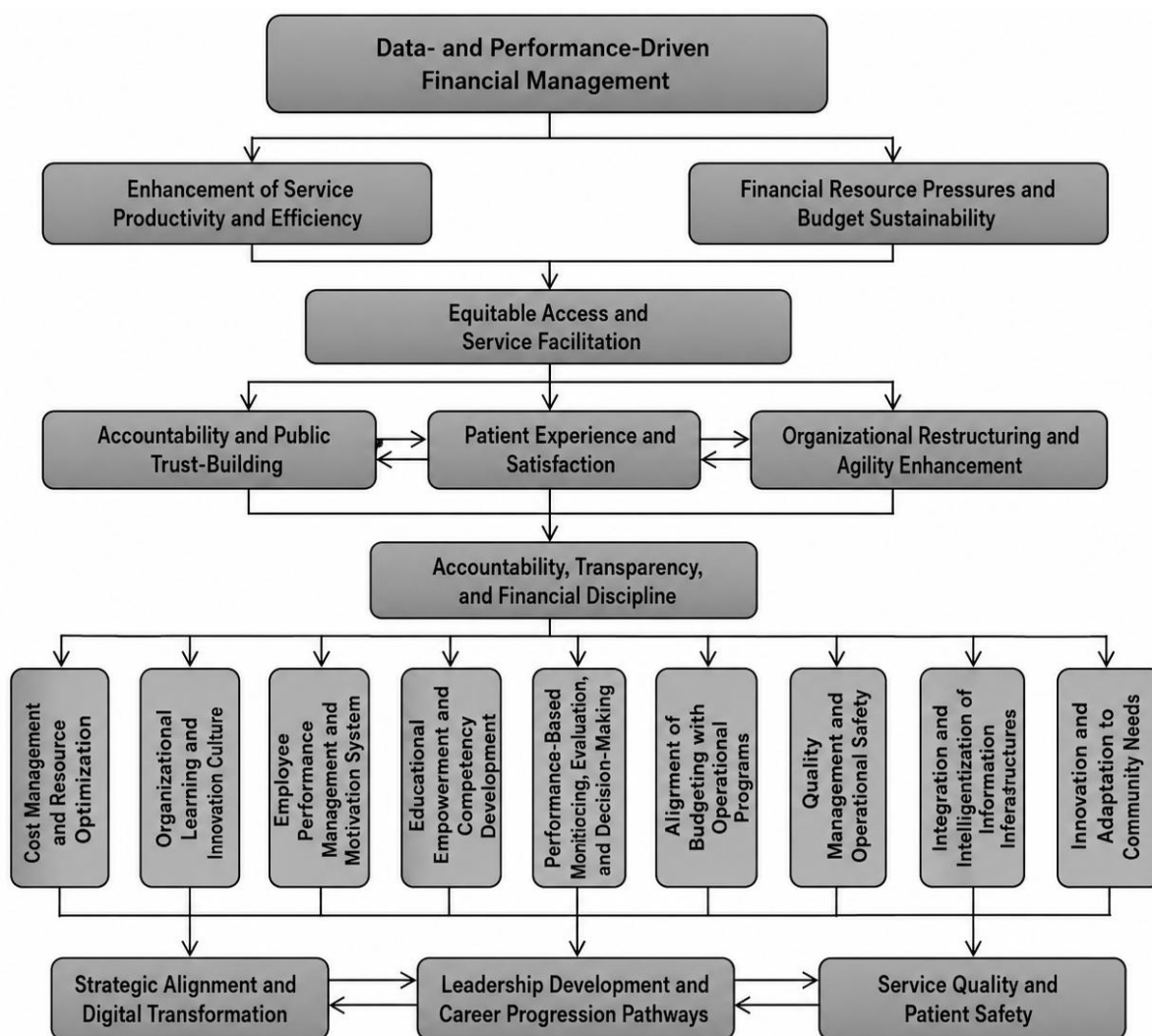
- At Level 1, representing the least influential level, three factors were identified. Because these factors were positioned at the lowest level of influence, they were removed from subsequent calculations, and the analysis continued without them. These factors were:
- “Service quality and patient safety,” “leadership development and career progression pathways,” and “strategic alignment and digital transformation.”
- At Level 2, seven factors were identified, including:
- “Innovation and adaptation to community needs,” “integration and intelligentization of information infrastructures,” “quality management and operational safety,” “performance-based monitoring, evaluation, and decision-making,” “educational empowerment and competency

development,” “employee performance management and motivation system,” and “organizational learning and innovation culture.”

- At Level 3, only one factor was identified:
- “Accountability, transparency, and financial discipline.”
- At Level 4, three factors were identified. Similar to Level 1, these factors were also excluded from the final calculation process. These factors were:
- “Organizational restructuring and agility enhancement,” “patient experience and satisfaction,” and “accountability and public trust-building.”
- At Level 5, only one factor was identified:
- “Equitable access and service facilitation.”
- The remaining factors were positioned at the final two levels, Levels 6 and 7. At Level 6, the two factors were “financial resource pressures and budget sustainability” and “enhancement of service productivity and efficiency.”
- Finally, Level 7, which represents the highest and most influential level of the model, included one key factor:
- “Data- and performance-driven financial management.”
- Accordingly, all identified factors within the model were classified and positioned across the seven levels of influence. This structure provided the basis for the final analysis and development of the proposed research model.

Figure 1

Leveling of the components of Balanced Scorecard-based budgeting in Iran's healthcare sector using the ISM–MICMAC approach.



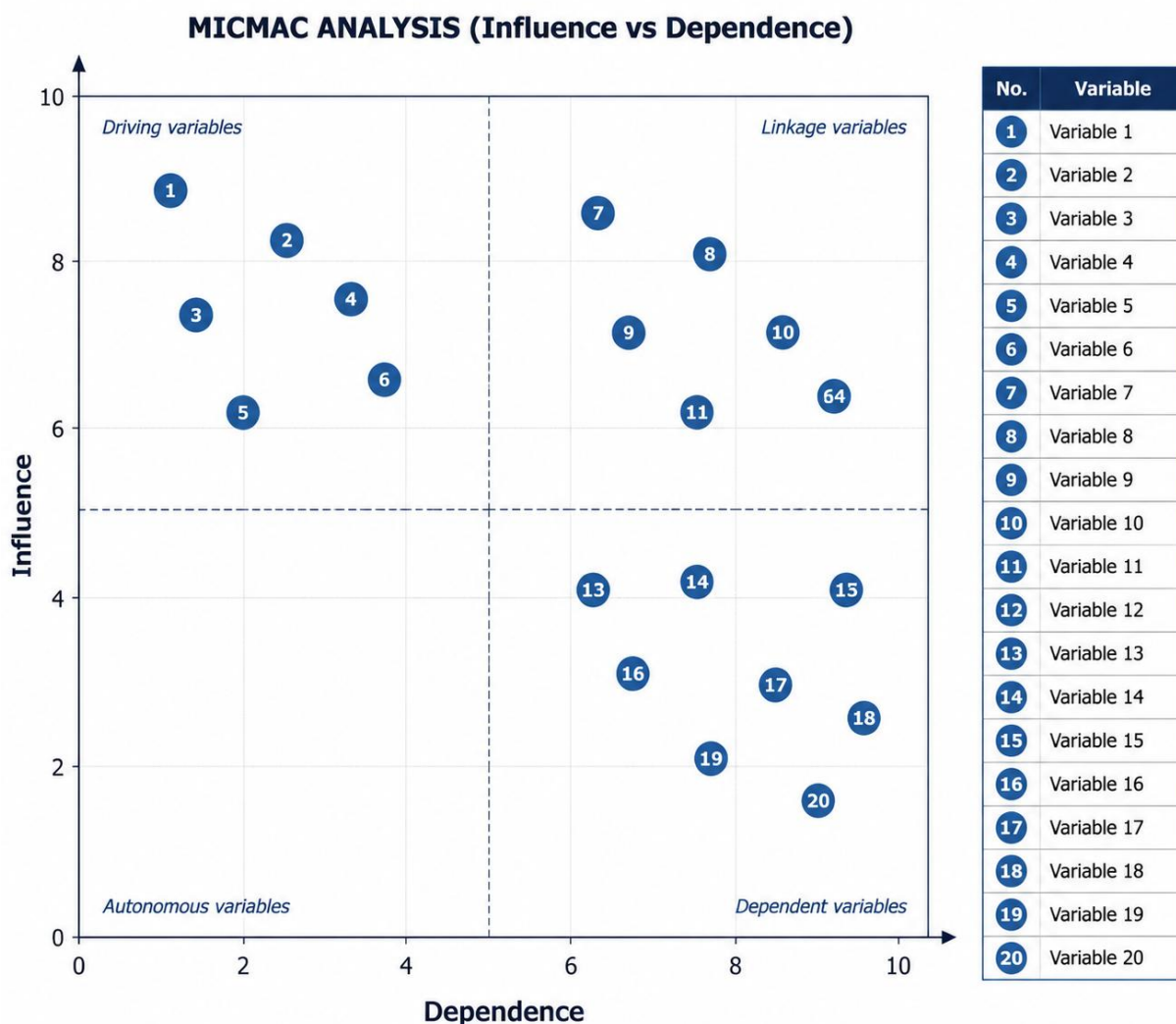
Step 6. MICMAC Diagram

The objective of MICMAC analysis is to identify and analyze the driving power and dependence power among factors. In this analysis, factors are classified into four categories based on their driving power and dependence power. The first category comprises autonomous variables, which have weak driving power and weak dependence. These factors are relatively disconnected from the system and have few and weak relationships with it. Dependent factors constitute the second category and have low driving

power but high dependence. The third category comprises linkage factors, which possess both high driving power and high dependence. These factors are unstable because any change in them can affect the system, while feedback from the system can, in turn, alter these factors again. The fourth category includes independent factors, which have strong driving power but weak dependence. After determining the multilevel model, the driving power–dependence diagram is plotted as follows.

Figure 2

MICMAC diagram.



The MICMAC diagram indicates that the 20 identified factors were analyzed within four regions based on their degree of driving power and dependence. No variable was located in the autonomous region, indicating that all factors in the model have meaningful interactions and relationships with other variables and that no factor is entirely independent or weakly connected to the system. Some variables were positioned in the driver (independent) variable region, characterized by high driving power and low dependence, and therefore function as the principal drivers of the model. These include factors such as data- and performance-driven financial management, financial resource pressures and budget sustainability, and enhancement of service productivity and efficiency. Another group was located in the linkage-variable region,

characterized by simultaneously high driving power and high dependence; because of their extensive interaction with other factors, these variables play a key role in the dynamics of the system. Several factors were also located in the dependent-variable region, indicating that they are primarily influenced by other variables and represent the outcomes of the functioning of other factors within the system. Overall, the distribution of the variables in the diagram demonstrates that the Balanced Scorecard-based budgeting model in the healthcare sector has an interconnected and systemic structure, and that improvement in the driver factors can substantially influence the other variables in the model and, ultimately, enhance the effectiveness of the budgeting system.

4. Discussion and Conclusion

The present study sought to identify and level the components of Balanced Scorecard-based budgeting in Iran's healthcare sector and to clarify their structural relationships through the combined application of Interpretive Structural Modeling (ISM) and MICMAC analysis. The findings demonstrated that the proposed budgeting framework is inherently multidimensional and systemic, with the identified components distributed across seven hierarchical levels. The results showed that data- and performance-driven financial management occupied the most influential level of the model, while financial resource pressures and budget sustainability, together with enhancement of service productivity and efficiency, were positioned at the next influential level. At intermediate levels, equitable access and service facilitation, accountability, transparency and financial discipline, patient experience and satisfaction, public trust-building, and organizational restructuring and agility enhancement emerged as important connecting components. In contrast, components such as service quality and patient safety, leadership development and career progression pathways, strategic alignment and digital transformation, organizational learning and innovation culture, competency development, and performance-based monitoring were located at higher outcome-oriented levels. MICMAC analysis further showed that none of the variables were autonomous, confirming that the budgeting system is strongly interconnected and that changes in one component can propagate through other dimensions of the system.

One of the most important findings was the placement of data- and performance-driven financial management at the highest driving level. This result indicates that the effective integration of reliable performance information into financial decision-making constitutes a foundational requirement for the functioning of a Balanced Scorecard-based budgeting system. In other words, the quality of budgetary decisions depends not only on the availability of financial data, but also on the ability of managers to integrate financial information with operational, patient-related, process, and learning indicators. This finding is consistent with the emerging literature emphasizing the integration of budgeting and multidimensional performance assessment. Aljumaili and Chouaibi emphasized that combining

budgeting with Balanced Scorecard perspectives can provide a more comprehensive basis for evaluating organizational performance and allocating resources strategically (5). Similarly, Hidayat showed that strengthening performance-based budgeting requires standardized performance indicators and a clear linkage between performance information and budgetary allocations (1). These studies support the present finding that data-driven financial management is not merely one component among others, but a core driver capable of shaping the overall effectiveness of the budgeting system.

The identification of financial resource pressures and budget sustainability as another major driver also reflects the realities of healthcare management. Healthcare institutions operate under persistent financial constraints caused by increasing service demand, inflation in medical costs, technological expenses, workforce requirements, and limitations in public and insurance financing. Consequently, the sustainability of financial resources significantly influences the feasibility of all other performance objectives. The findings suggest that unless healthcare organizations are able to stabilize funding and manage budgetary pressures, investments in service quality, digital infrastructure, human capital, and process improvement may remain constrained. This interpretation aligns with Barros, who emphasized that the Balanced Scorecard in public-sector settings must reflect the distinctive role of accountability, resource constraints, and strategic alignment rather than merely replicate private-sector financial logic (2). It also corresponds with Budarina's discussion of the Balanced Scorecard in healthcare institutions, where financial efficiency and resource utilization are closely intertwined with broader institutional performance (13). Thus, budget sustainability can be understood as a structural prerequisite for the realization of nonfinancial objectives.

The placement of enhancement of service productivity and efficiency among the main driving factors further highlights the close relationship between financial sustainability and operational performance. In healthcare settings, inefficient workflows, duplication of activities, prolonged service delivery times, underutilization of equipment, and inappropriate allocation of human resources can directly increase costs and weaken organizational performance. Therefore, improvements in service

productivity can generate financial benefits while simultaneously improving patient access and organizational responsiveness. This finding is compatible with the growing body of research demonstrating that operational modernization and technology-enabled process improvement can significantly enhance hospital performance. Tortorella et al. reported that Healthcare 4.0 technologies can improve hospital performance by strengthening process integration, operational responsiveness, and the use of real-time information (11). Likewise, Barzouzadeh and Nikbakht showed that implementation of an electronic fund request system could affect multiple dimensions of organizational performance assessed through the Balanced Scorecard (9). These findings reinforce the present result that operational efficiency is not merely an outcome of improved budgeting but can itself operate as a driving force within a strategic budgeting system.

Equitable access and service facilitation occupied an intermediate level in the ISM structure. This position indicates that accessibility is influenced by deeper financial and operational drivers while also exerting influence on patient satisfaction, public trust, and service quality. In a healthcare context, equitable access is a critical performance objective because it reflects the extent to which financial and organizational resources are translated into practical service availability. Improved budgeting can support equitable access by allocating resources according to demand, reducing administrative barriers, improving service distribution, and facilitating transparency in patient costs. The intermediate position of this component suggests that access functions as a bridge between managerial capacities and patient-centered outcomes. This interpretation is consistent with Behrouzi and Ma'aram, who demonstrated that hospital performance assessment requires indicators that extend beyond financial metrics to include dimensions directly related to patients and service delivery (7). It also accords with the broader BSC literature showing that healthcare organizations must balance internal efficiency with external stakeholder outcomes (3).

The findings also placed accountability, transparency, and financial discipline at a distinct intermediate level, suggesting that these characteristics are shaped by foundational financial and operational capacities but also

influence subsequent organizational outcomes. Transparent budgeting and financial discipline can strengthen trust among regulators, insurers, employees, and patients by making resource allocation processes more visible and justifiable. Within a Balanced Scorecard framework, transparency also supports the credibility of performance measurement because indicators must be connected to verifiable financial and operational information. This finding is supported by research emphasizing the governance function of BSC-based monitoring. Bejja and Najdi demonstrated that a Balanced Scorecard-driven performance dashboard can strengthen governance by translating strategic objectives into monitorable indicators and making organizational performance more visible to decision makers (14). Similarly, Barros highlighted the importance of accountability and strategic control in the use of Balanced Scorecards within public organizations (2). The present findings therefore suggest that financial discipline should be understood not only as a technical accounting concern but as an organizational governance mechanism.

At the next level, patient experience and satisfaction, accountability and public trust-building, and organizational restructuring and agility enhancement appeared as mutually interconnected components. Their simultaneous placement at the same level indicates that these dimensions may reinforce one another dynamically. Organizational agility can improve responsiveness to patient needs, while greater responsiveness can strengthen satisfaction and public trust. Conversely, patient feedback and public expectations may pressure healthcare organizations to redesign processes, simplify decision-making, and adapt structures. The importance of patient experience is consistent with Adams et al., who showed that patient-related indicators are increasingly used in healthcare performance assessment, although they should not be interpreted in isolation (8). The present findings strengthen this argument by positioning patient satisfaction within a broader structural network rather than treating it as a standalone outcome. In addition, organizational restructuring and agility reflect the need for healthcare institutions to adapt rapidly to operational and strategic challenges, which is consistent with the emphasis on adaptive and resilient performance systems in contemporary healthcare management (12).

The interrelationship between patient experience and public trust is also theoretically meaningful. Healthcare organizations depend heavily on public confidence, and perceptions of fairness, transparency, communication quality, safety, and accessibility can directly affect trust. A budgeting framework that improves service availability and patient-centered outcomes may therefore indirectly strengthen institutional legitimacy. This is particularly important for public healthcare systems in which citizens assess performance not only through clinical results but also through perceived responsiveness and fairness. The results suggest that these patient-oriented outcomes are generated through the combined influence of financial discipline, operational efficiency, access, and organizational adaptability. This multidimensional pathway is consistent with the underlying logic of the Balanced Scorecard, which assumes that performance outcomes emerge from interdependent causal relationships across perspectives rather than isolated improvements within individual indicators (3, 4).

Another important finding was the placement of several learning, growth, and technological components at higher levels of the model. Educational empowerment and competency development, employee performance management and motivation, organizational learning and innovation culture, strategic alignment and digital transformation, and leadership development appeared as factors whose effectiveness is influenced by deeper structural conditions. Although these dimensions are often conceptualized as foundational elements in the classical Balanced Scorecard, the present findings suggest that within the specific context of healthcare budgeting in Iran, their successful development may depend substantially on financial stability, effective resource allocation, operational efficiency, and data-driven management. This does not diminish their importance; rather, it indicates that organizations may struggle to sustain training, innovation, digital transformation, and leadership development when financial and operational foundations are weak. Budarina emphasized that the effectiveness of the Balanced Scorecard in healthcare depends on its practical integration into institutional management rather than its formal adoption alone (13). Similarly, Almeida Marques proposed a digitalized and resilience-oriented Balanced Scorecard in

which technological and organizational capabilities are embedded within broader strategic and institutional conditions (12).

The role of digital transformation in the model also deserves particular attention. Although strategic alignment and digital transformation appeared at an outcome-oriented level, information infrastructure and intelligitization of information systems were among the important Level 2 factors. This distinction suggests that digital transformation should be differentiated from basic technological infrastructure. The availability of integrated information systems, electronic records, dashboards, and data platforms may be necessary to enable higher-order digital transformation, but strategic digitalization requires organizational readiness, leadership, learning, and alignment with institutional objectives. This interpretation is strongly supported by Tortorella et al., who showed that the performance effects of Healthcare 4.0 depend on the organizational implementation of digital technologies rather than their mere availability (11). It is also consistent with Bejja and Najdi's findings on the governance benefits of a BSC-driven performance dashboard, where digital tools served as mechanisms for integrating performance information into managerial decision-making (14). Therefore, healthcare organizations should distinguish between technical infrastructure as an enabling condition and digital transformation as a broader strategic outcome.

The results concerning organizational learning and innovation are also notable. Organizational learning culture, employee competency development, and performance management were closely associated with the broader Balanced Scorecard system, indicating that financial and operational reforms must eventually be translated into human and organizational capabilities. Effective use of performance data requires employees who understand indicators, managers who can interpret them, and organizational routines that encourage feedback and improvement. This supports the broader argument that performance systems cannot succeed through technical measurement mechanisms alone. Hadi et al. highlighted the multidimensional nature of healthcare provider performance and the need to identify a broad range of performance factors beyond purely financial dimensions (6). Yaghoubi et al. similarly showed that Balanced Scorecard indicators can

support the structured management of performance priorities, including dimensions that require organizational learning and internal capability development (16). The present findings extend this logic by showing how these components are structurally embedded within a wider budgeting architecture.

The placement of service quality and patient safety at Level 1 indicates that these variables function primarily as high-level outcomes generated by the interaction of numerous underlying factors. This result is particularly important because quality and safety are often treated as direct managerial targets; however, the present structural model suggests that sustainable improvement in these outcomes requires prior strengthening of financial management, operational efficiency, information systems, staff competencies, organizational learning, and patient-centered processes. In other words, quality and safety should be viewed as emergent properties of the system. This interpretation is consistent with Behrouzi and Ma'aram's emphasis on the need for hospital performance measures that capture the multidimensional determinants of healthcare quality (7). It also corresponds with the systematic evidence reviewed by Bohm et al., showing that healthcare Balanced Scorecards typically incorporate multiple interrelated dimensions that collectively contribute to quality improvement (4).

The MICMAC findings further strengthened the systemic interpretation of the model. The absence of autonomous variables indicates that none of the identified components operates independently of the overall budgeting and performance structure. This finding suggests that isolated interventions may have limited effectiveness if they are not aligned with other organizational dimensions. For example, introducing a digital dashboard without strengthening data quality and managerial competencies may not improve decision-making; similarly, expanding training programs without adequate financial resources and performance incentives may fail to produce lasting effects. This result is consistent with integrated performance management perspectives that emphasize the importance of considering relationships among multiple performance criteria. Digebsara et al. demonstrated that combining complementary performance evaluation frameworks can provide a more comprehensive understanding of

organizational effectiveness than reliance on a single isolated system (10). Likewise, Mirzaei et al. showed that combining the Balanced Scorecard with multicriteria decision-making methods can improve the prioritization and comparative evaluation of performance factors (15). The present ISM–MICMAC results extend this integrated logic by explicitly demonstrating the dependency structure among budgeting components.

Overall, the findings indicate that Balanced Scorecard-based budgeting in Iran's healthcare sector should be designed as an integrated strategic management system rather than as a narrowly financial budgeting technique. The model suggests a sequence in which data- and performance-driven financial management, resource sustainability, and operational efficiency establish the foundation for equitable service access and financial accountability. These conditions then support patient satisfaction, public trust, organizational agility, and a range of learning, innovation, digital, and quality-related outcomes. This hierarchical structure is consistent with the central logic of the Balanced Scorecard, according to which financial, customer, internal process, and learning-and-growth perspectives are causally interrelated. However, the findings also provide a context-specific refinement by showing that the relative structural position of these components may differ in healthcare budgeting depending on institutional and financial conditions. Therefore, the proposed model contributes by integrating the multidimensional logic of the Balanced Scorecard with the hierarchical and dependency analysis offered by ISM and MICMAC.

This study has several limitations that should be considered when interpreting the findings. First, the qualitative and structural modeling phases relied on the judgments of a relatively small panel of 15 academic and executive experts; although purposive selection and expert involvement are appropriate for ISM-based studies, a larger and more heterogeneous panel might have produced additional perspectives or alternative relationship structures. Second, the findings are context-specific to Iran's healthcare sector and may reflect its particular financing arrangements, administrative structures, regulatory environment, and organizational culture. Third, ISM and MICMAC are largely based on expert perceptions of relationships among variables and do not directly estimate causal effects using longitudinal

or experimental data. Fourth, the model focuses on structural relationships among the identified components but does not quantify the relative magnitude of each relationship. Finally, the study did not compare different types of healthcare institutions, such as public, private, university-affiliated, and specialized hospitals, which may differ in budgeting practices and strategic priorities.

Future studies are recommended to validate the proposed model using larger samples of healthcare managers, financial officers, clinicians, and policymakers across different provinces and organizational settings. Quantitative techniques such as structural equation modeling could be used to test the causal pathways suggested by the ISM structure and to estimate the strength of relationships among the identified components. Comparative studies could examine whether the hierarchical pattern differs across public, private, nonprofit, and university-affiliated healthcare institutions. Longitudinal research would also be valuable for assessing whether improvements in driver variables lead to measurable changes in dependent variables over time. Future studies may further integrate methods such as DEMATEL, ANP, fuzzy ISM, or hybrid multicriteria decision-making approaches to refine prioritization of the components. In addition, researchers could investigate how environmental factors such as inflation, insurance reimbursement policies, digital maturity, organizational size, and regional inequalities influence the effectiveness of Balanced Scorecard-based budgeting.

Healthcare policymakers and managers should prioritize the development of data- and performance-driven financial management as the central foundation of Balanced Scorecard-based budgeting. This requires integrated information systems, timely and reliable financial and operational data, standardized performance indicators, and managerial capacity for evidence-based decision-making. Budgeting processes should be explicitly linked to strategic objectives and measurable outcomes across the financial, patient, internal process, and learning-and-growth perspectives. Particular attention should be given to stabilizing financial resources, improving operational productivity, and facilitating equitable access to services, as these factors occupy influential positions within the model. Healthcare institutions should also strengthen financial transparency, accountability mechanisms, and continuous

performance monitoring. Investments in staff development, leadership, organizational learning, and digital transformation should be coordinated with the organization's financial and operational capacities rather than implemented as isolated initiatives. Finally, managers should use the hierarchical structure identified in this study as a roadmap for sequencing interventions, beginning with the principal driver factors and progressively targeting the dependent and outcome-oriented components.

Authors' Contributions

All authors contributed substantially to the study and to manuscript development, and all approved the final version.

Declaration

The authors declare that artificial intelligence tools were used only to assist with language editing, translation, and improvement of the manuscript's readability. All conceptualization, study design, data collection, data analysis, interpretation of findings, and final approval of the manuscript were performed by the authors. The authors take full responsibility for the accuracy, integrity, and originality of the content.

Transparency Statement

Data are available for research purposes upon reasonable request to the corresponding author.

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Declaration of Interest

The authors report no conflict of interest.

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Ethics Considerations

The study placed a high emphasis on ethical considerations. Informed consent obtained from all

participants, ensuring they are fully aware of the nature of the study and their role in it. Confidentiality strictly maintained, with data anonymized to protect individual privacy. The study adhered to the ethical guidelines for research with human subjects as outlined in the Declaration of Helsinki.

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