International Journal of Applied Operational Research
Vol. 13, No. 2, pp. 81-104, Spring 2025

Journal homepage: ijorlu.liau.ac.ir

Designing a dynamic model for managing the resources and expenditures of the social security organization using grounded theory and multi-criteria decision-making (MCDM)

S. Abdollahi Shemami, S. Balaei Pakdehi*, E. Chirani

Received: 14 January 2025 ; **Accepted:** 22 March 2025

Abstract This study aims to develop a dynamic model for managing the resources and expenditures of Iran's Social Security Organization by integrating grounded theory and multi-criteria decision-making (MCDM) approaches. The research identifies and ranks causal, contextual, and intervening variables affecting the organization's financial balance. Methodologically, the study is applied in purpose and descriptive-survey in nature. The statistical population is divided into two groups: the qualitative phase includes interviews with experts and policymakers, while the quantitative phase involves senior, middle, and expert-level managers of the organization. A purposive and snowball sampling method was used to select 15 experts. The qualitative findings led to the identification and categorization of key variables, while the quantitative phase applied the fuzzy COCOSO method to rank the factors and outcomes. Results indicate that contextual factors are the most influential in shaping the organization's financial dynamics, followed by intervening conditions and causal factors. Additionally, a system dynamics approach was employed to simulate and analyze three policy scenarios: Gradual increase in insurance premiums for government-supported workshops by 1% annually from 2023to 2033, projected to yield a positive return of 245,000 billion rials per year. Reduction of healthcare costs through direct treatment models, ISO-standard equipment procurement, and recruitment of skilled personnel, expected to generate 32 trillion rials in savings by 2023. And Workforce retention support through shared unemployment benefit payments (50% by the fund, 50% by employers), with partial government reimbursement, projected to improve the unemployment fund's balance by 13 trillion rials by 2033.

Keyword: Resources and Expenditures, Grounded Theory, Fuzzy COCOSO, Social Security Organization, System Dynamics Model.

1 Introduction

Social security systems are key to public trust and development. In Iran, the Social Security Organization (SSO), as the largest private sector insurer, plays a crucial role in supporting

* **Corresponding Author.** (✉)
E-mail: sirousbalaei@yahoo.com (S. Balaei Pakdehi)

S. Abdollahi Shemami
Department of Industrial Management, Rasht Branch, Islamic Azad University, Rasht, Iran

S. Balaei Pakdehi
Department of Industrial Management, Rasht Branch, Islamic Azad University, Rasht, Iran

E. Chirani
Department of Business Management, Rasht Branch, Islamic Azad University, Rasht, Iran

[DOI: 10.71885/ijorlu-2025-2-700]

various sectors. Implementing a transparent performance evaluation system is essential for improving service quality and achieving broader socio-economic impact nationwide [1].

To ensure fair income distribution, arbitrary state actions were banned and social rights legalized. The welfare state model aimed to tackle social issues holistically, combining capitalism with public investment for vulnerable groups. Its theoretical basis was William Beveridge's 1942 report, which emphasized reducing income inequality and promoting social justice [2].

The welfare state peaked from the late 1940s to mid-1970s, with governments actively managing social programs like healthcare and employment. From the mid-1970s onward, economic and social crises aging populations, unemployment, and globalization—strained the system. Rising costs and the spread of neoliberalism led to reforms that reduced state involvement and emphasized personal responsibility [3].

In the 1980s, social security systems underwent major reforms focused on privatization and market-based approaches. Countries like the UK, New Zealand, and Chile pioneered changes such as pension privatization and outsourcing, aiming to reduce state costs and boost individual autonomy. While some saw greater efficiency, others faced increased inequality and diminished access to services [4].

The 2008 global financial crisis profoundly affected social security systems worldwide. Soaring unemployment and poverty placed unprecedented pressure on social spending, forcing governments to assist affected populations while contending with growing fiscal deficits. This dual challenge led to a reappraisal of neoliberal approaches and a renewed emphasis on expanding public welfare provisions [5]. OECD data from 1990 to 2019 indicate a rise in public social expenditures across numerous countries following the crisis [6]. Ultimately, the financial meltdown exposed structural weaknesses in market-oriented social security models, raising critical questions about the adequacy and long-term viability of privatized approaches [7].

Table 1 Public social expenditures in some OECD countries (1990-2019): OECD [6]

Country	1990	1995	2000	2005	2010	2015	2018	2019
Canada	17.5	18.3	15.7	16.1	17.6	17.9	18	-
Chile	9.8	11	10.4	8.9	10.6	10.9	11.3	11.4
France	2.4	24.4	28.5	27.7	28.8	31.1	31.8	31
Germany	21.4	25.2	25.5	26.4	26	25	25.3	25.9
Italy	20.6	21.1	22.6	24.1	27	28.3	27.8	28.2
Japan	10.9	13.2	15.4	17.1	21.2	22.2	-	-
Korea	2.6	3	4.4	5.9	7.9	9.6	10.8	12.2
United Kingdom	14.9	16.6	16.9	19.3	23.3	21.5	20.3	20.6
USA	13.2	14.9	14.1	15.5	19.1	18.5	18.2	18.7

Following the global financial crisis, the International Labour Organization (ILO) advocated for stronger social security systems. Its 2012 Recommendation on National Floors of Social Protection promoted universal access to comprehensive support beyond traditional insurance including social assistance, essential services, and labor market protections. The goal was to build inclusive, sustainable systems that protect individuals across all life stages [8].

Social security has evolved from basic communal aid to complex institutional systems. The 20th century saw the rise of the welfare state aimed at reducing inequality and expanding protection. However, recent challenges globalization, aging populations, and shifting socio-economic conditions led to reforms favoring privatization and individual responsibility. The 2008 financial crisis highlighted the need for robust, inclusive systems. In response, the ILO

[DOI: 10.71885/ijorlu-2025-2-700]

has championed comprehensive social protection and promoted national social protection floors [9].

Iran's Social Security Organization (SSO) covers over half the population and is central to pension system stability. However, demographic changes such as skewed age distribution, delayed government contributions, and generous pension formulas have strained insurance funds [10]. Addressing these pressures requires revising pension formulas, raising the retirement age, and implementing structural reforms like deregulation and inflation control to balance financial resources and expenditures [11]. Iran's social security system includes both contributory and non-contributory schemes, covering 68% of the active workforce and 46% of the elderly. Financial sustainability hinges on the balance between revenues and expenditures, with socio-economic shifts turning expenditures into major stress points [12]. Social security spending is divided into three domains:

- Insurance-related: pensions, unemployment, healthcare, etc.
- Support-oriented: welfare services and subsidies
- Relief-based: emergency aid These are further grouped by service stages—pensions, healthcare, and unemployment [13].

The system relies on taxation and statutory premiums. Macroeconomic factors such as inflation, unemployment, exchange rates, and interest rates significantly affect expenditure levels [14]. Rising unemployment increases benefit demands, worsening the financial balance [15]. Inflation drives up healthcare costs and pension adjustments [16], while exchange rate volatility and interest rate shifts further destabilize expenditures [17]. The contributor-to-retiree ratio has dropped from 11.6 in 1981 to 4.3 in 2021, with projections showing continued decline. A ratio below five signals vulnerability to economic and political shocks [18]. The ILO defines social security as encompassing support for aging, illness, unemployment, and more, aligned with Convention No. 102. Globally, systems face risks from legal, economic, and political complexities [19][20].

Rising costs from aging populations and healthcare have led to policies promoting financial sustainability. Strong financial governance is essential for maintaining fiscal balance and guiding public sector reform [21]. Managers must navigate risks from market volatility, political unrest, and technological disruption, which impact both national interests and corporate operations. Addressing these risks is key to long-term stability [22]. Iran's SSO faces a critical phase with increasing retirees and fewer contributors. This imbalance, driven by both demographic and strategic shortcomings, threatens its role in poverty reduction and income redistribution.

The financial imbalance in Iran's Social Security Organization (SSO) is intensifying as pension funds enter a critical midlife phase marked by rising retirees and dwindling contributors. This strain stems not only from demographic shifts but also from broader structural and strategic shortcomings. As Iran's largest social insurance entity, the SSO plays an essential role in income redistribution, poverty reduction, and societal well-being yet now faces a pressing mismatch between resources and expenditures.

To avoid a looming crisis, immediate strategic research and planning are necessary to diagnose root causes and propose sustainable funding solutions. The organization's financial health hinges on both macroeconomic conditions and internal policy design. Key influencing factors include the active labor force, employment and wage levels, investment inflows, and efficiency in premium collection. With income largely sourced from premiums and investment returns especially through Shasta the need for sound financial governance has never been greater. Strengthening financial management is crucial not only to ensure long-term solvency, but also to bolster accountability, transparency, and risk mitigation across the system.

[DOI: 10.71885/ijorlu-2025-2-700]

Accordingly, the following key research questions are raised:

1. What factors influence the improvement of the Social Security Organization's revenues and expenditures?
2. How can a dynamic model be designed to enhance the management of revenues and expenditures within Iran's Social Security Organization?
3. How can various policy scenarios be developed to improve the financial balance of the Social Security Organization?

To guide the reader through the structure of this study, the remainder of the paper is organized as follows. Section 2 provides a comprehensive review of the relevant literature, establishing the theoretical background and identifying research gaps. Section 3 outlines the methodology, including the use of Grounded Theory as a qualitative approach for theory development, and the application of the fuzzy COCO-SO method for multi-criteria decision analysis. Section 4 details the data collection process and interpretation of expert opinions, followed by the ranking of criteria and sub-criteria. Finally, Section 5 presents the main conclusions of the study and offers directions for future research.

2 Literature review

Du et al. [23] examined healthcare expenditure among the elderly in China, exploring whether rising costs are due to aging itself or end-of-life care needs the so-called "Red Herring Hypothesis." Using data from the Chinese Longitudinal Healthy Longevity Survey (2005–2018) and Heckman selection and two-part models, they found that proximity to death not age per se is the primary driver of healthcare spending. Income, social security, and health status also significantly affect costs but do not serve as red herring variables.

Ilcheva [24] focused on the role of social innovation in strengthening social security in Bulgaria. The study highlights the relevance of innovation agendas for high-risk countries with outdated welfare systems and limited public resources. Social innovation is identified as an effective tool by the European Commission to address growing social risks. The report analyzes how such innovations can enhance social protection by responding to specific national challenges.

Ebrahimi Daneshmand et al. [25] developed a performance evaluation model for Iran's Social Security health system using the Balanced Scorecard (BSC) approach. The mixed-method study, using expert input and qualitative content analysis, identified seven key perspectives: internal processes (0.35), social responsibility (0.24), customer (0.11), health after treatment (0.09), health after prevention/care (0.07), learning/growth (0.069), and financial (0.069), with 46 related performance indicators. The study emphasized integrating health dimensions and social accountability into the BSC framework.

Alipour et al. [12] prioritized challenges affecting the financial sustainability of Iran's Social Security Organization. Key economic-social risks included inflation, stagnation, investment challenges, unemployment, and unpredictable shocks (e.g., COVID-19, sanctions). Institutional risks were linked to government debt, budget delays, rising expenditures, limited fund autonomy, and underperforming subsidiaries. Managerial challenges included weak investment structures, poor planning, inefficient operations, and inadequate data systems.

Mortezavi Saraei et al. [18]: This study used system dynamics modeling to assess the financial impact of the COVID-19 pandemic on Iran's Social Security Organization. It concluded that raising the contribution rate from 30% to 35% and increasing the retirement age

[DOI: 10.71885/ijorlu-2025-2-700]

by five years would significantly strengthen the organization's financial position and prevent insolvency.

Tadayon et al. [26] The research emphasized that establishing an independent, cross-sectoral governance mechanism as outlined in Iran's national social security policies—is a prerequisite for reforming health financing. Without this central framework, redesigning other welfare institutions would remain ineffective. The study proposes elevating social security governance to a ministerial level and recognizing the High Council of Health Insurance as a core welfare body.

Moghaghzadeh et al. [10]: This research applied economic-demographic modeling to estimate the financial viability of the Social Security Organization under parametric reform scenarios. Challenges identified included generous pension formulas, low retirement age, and government non-payment of premium contributions. Suggested reforms include increasing the retirement age and adjusting benefit formulas.

Alipour et al. [12]: The study provided a structured model outlining the challenges to balancing resources and expenditures in the Social Security Organization. These challenges span three dimensions:

- **Economic/Social Conditions:** inflation, recession, investment risk, employment instability.
- **Structural Conditions:** legislative inconsistencies, lack of accountability, premature retirement, evasion of premiums, and rising government debt.
- **Intervention Factors:** poor data systems, lack of technological integration, managerial inefficiencies, poor budgeting, weak investment mechanisms, and an absence of systematic evaluation. The study found that **intervention conditions**, amplified by structural issues, are the most influential in creating fiscal imbalance.

Mehdipoor [27] compared two automatic adjustment mechanisms in pension reform: actuarial balance and capital spillover. Findings indicated that while reform is necessary in both models, incorporating future capital spillover as revenue reduces the required increases in retirement age and contribution rates to achieve financial equilibrium.

Godínza-Oliveras et al. [28] The researchers proposed optimal parametric reform strategies aimed at preserving the long-term sustainability of pension systems while ensuring liquidity. Two automatic balancing mechanisms were introduced that optimize retirement age, contribution rates, and pension adjustment formulas to maintain annual solvency alongside structural equilibrium.

Godínza-Oliveras et al. [29] Building upon their earlier work, this study developed a liquidity-restoration mechanism for pension systems using logarithmic functions. It established constraints—such as maintaining positive capital spillover and forecasted optimal values for contribution rates, retirement age, and pension indexation over a 20-year horizon.

Raghfar & Akbarbeygi [30] This research investigated the macroeconomic impacts of a critical parametric reform: altering the pension replacement rate. Their findings emphasized the broader economic implications of such adjustments, particularly in terms of labor market dynamics and fiscal outcomes.

De la Fuente & Doménech [31] In this study, the authors created a forecasting model to assess the future cost of pensions in Spain. Assuming trends in employment, productivity, and demographic change, they evaluated how the 2011 pension reform would influence pension expenditures as a share of GDP.

[DOI: 10.71885/ijorlu-2025-2-700]

Table 2 Summary of Existing Research on Social Security Systems

Authors	Country/Region	Focus	Key Findings	Methodology
Cistian [32]	EU-15	Pension expenditures as % of GDP	Fertility, life expectancy, effective retirement age, and gross savings significantly affect public pension costs	Panel data regression (1995–2009)
Zonetti & Biltexi [33]	Belarus	Financial sustainability of pension system	Gradual retirement age increase, benefit indexation reform, and two-tier system with notional accounts improve long-term sustainability	Policy forecasting
Sapir et al. [34]	EU	Demographics and wage changes	Aging and wage dynamics significantly impact public aging-related expenditures; simulated policy scenarios using system dynamics	Simulation modeling
Dashtban Farouji et al. [35]	Iran	Transition to funded pension system	Full funding improves capital accumulation and income distribution, reduces poverty	Overlapping generations model
Sin [36]	China	Pension reform options	Raising retirement age to 65 and indexing benefits to prices reduces pension deficit by 24 percentage points	Policy simulation
Akwimbi & Julius [37]	Kenya	Social security sustainability	Weak institutions, low coverage, poor public awareness, and demographic challenges threaten sustainability; reforms needed	Institutional analysis
Haberman & Zimbidis [38]	Global	Optimal retirement age and contribution rates	Linear functions used to forecast optimal retirement age and contribution rates	Mathematical modeling
Disney [39]	OECD	Pension reform strategies	Parametric reforms, accumulation rate changes, individual accounts, and partial privatization all have distinct fiscal impacts	Comparative policy analysis
Pampel & Williamson [40]	Cross-national	Public pension spending determinants	Age structure and insurance program maturity are key drivers; class-based variables less influential	Time-series and cross-national analysis

While numerous studies have examined the financial sustainability of social security systems through parametric reforms, actuarial modeling, or performance evaluation tools, this research advances the field by integrating qualitative insights from grounded theory with quantitative multi-criteria decision-making (MCDM) to design a dynamic, scenario-based model for managing the revenues and expenditures of Iran's Social Security Organization.

[DOI: 10.71885/ijorlu-2025-2-700]

Unlike earlier works that treat economic, demographic, and policy drivers in isolation, this study innovatively prioritizes systemic variables through expert-driven ranking and simulates their interactive impacts using system dynamics modeling. It also incorporates stakeholder concerns such as intergenerational equity, policy responsiveness, and fiscal transparency into a unified model, enabling policymakers to test reform scenarios (e.g., contribution adjustments, retirement age policies) under diverse economic and demographic conditions. The novelty of this research lies in its multi-level, data-informed approach to financial governance, bridging empirical complexity with decision-oriented tools to support long-term solvency, equity, and resilience in social protection planning.

3 Methodology

This study consists of two phases: Qualitative and quantitative. In the qualitative phase, the factors influencing the revenues, expenditures, and financial sustainability of the Social Security Organization will be identified using grounded theory through expert interviews. The collected data will be analyzed with relevant software to extract key categories, including contextual factors, intervening conditions, causal conditions, and potential outcomes. In the subsequent phase, multi-criteria decision-making (MCDM) methods will be applied to prioritize these factors. Finally, system dynamics modeling will be employed to develop a dynamic model that addresses financial sustainability and explores the interactive effects of the identified variables on the organization's revenue and expenditure system.

3.1 Grounded Theory

Grounded Theory is a qualitative research method used to develop theories grounded in real-world data. Researchers collect and analyze interview transcripts, documents, or observations, and use coding techniques to identify recurring themes and build a conceptual model. It's especially useful when no existing theory adequately explains a process or phenomenon. [41]

The research sample consisted of 15 social security experts selected through snowball sampling. The study involved 35% managerial staff and 65% specialists in the field of social security, with 14% holding doctoral degrees and 86% holding bachelor's or master's degrees. Given the participants' high level of expertise and professional experience, the reliability of the study's findings is well supported. The primary research questions centered on identifying the challenges of social security revenues and expenditures, as well as the contextual, intervening, economic, and social factors contributing to financial imbalance.

3.2 Fuzzy COCOSO (Combined compromise solution)

This is a multi-criteria decision-making (MCDM) technique that ranks and prioritizes alternatives when decision factors are vague or uncertain. The fuzzy extension incorporates fuzzy logic to handle ambiguity in expert judgments. It combines distance-based and compromise-based solutions to identify the best-performing option with respect to multiple conflicting criteria [42].

[DOI: 10.71885/ijorlu-2025-2-700]

3.2.1 Construct the Fuzzy Decision Matrix

Collect expert evaluations or scores for various alternatives against multiple criteria using fuzzy numbers (typically triangular fuzzy numbers). This captures uncertainty or vagueness in judgments.

$$\tilde{X} = \begin{bmatrix} \tilde{x}_{11} & \tilde{x}_{12} & \cdots & \tilde{x}_{1n} \\ \tilde{x}_{21} & \tilde{x}_{22} & \cdots & \tilde{x}_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ \tilde{x}_{m1} & \tilde{x}_{m2} & \cdots & \tilde{x}_{mn} \end{bmatrix} \quad i = 1,2,\dots,m; \;\; j = 1,2,\dots,n$$

3.2.2 Normalize the Decision Matrix

Convert fuzzy scores into a comparable scale (usually between 0 and 1), considering whether criteria are benefit-type or cost-type. where equation (1) is used for benefit criteria, and equation (2) is used for cost criteria.

$$\tilde{r}_{ij} = \left(r_{ij}^{l}, r_{ij}^{m}, r_{ij}^{u}\right) = \frac{\tilde{x}_{ij} - \min(x_{ij})}{\max(\tilde{x}_{ij}) - \min(\tilde{x}_{ij})} \tag{1}$$

$$\tilde{r}_{ij} = \left(r_{ij}^{l}, r_{ij}^{m}, r_{ij}^{u}\right) = \frac{Max(x_{ij}) - \tilde{x}_{ij}}{\max(\tilde{x}_{ij}) - \min(\tilde{x}_{ij})} \tag{2}$$

3.2.3 Determine Criteria Weights

Use methods such as expert judgment, entropy, or fuzzy weighting techniques to assign the relative importance of each criterion. Finding the sum of the weighted comparability sequence (S_{ij}) and the power weighted comparability sequences (P_{ij}) for each alternative using the following equations

$$\tilde{S}_{ij} = \left(S_{ij}^{l}, S_{ij}^{m}, S_{ij}^{u}\right) = \sum_{j=1}^{n} \widetilde{W}_{jc}\tilde{r}_{ij} \tag{3}$$

$$\tilde{P}_{ij} = \left(P_{ij}^{l}, P_{ij}^{m}, P_{ij}^{u}\right) = \sum_{j=1}^{n} \left(\tilde{r}_{ij}\right)^{\widetilde{W}_{jc}} \tag{4}$$

3.2.4 Calculate Weighted Normalized Decision Matrix

Multiply each normalized fuzzy value by its corresponding fuzzy weight to form the weighted matrix. Developing the aggregated appraisal scores to calculate the relative weights of alternatives using three strategies, Equation 7 offers a compromise between the WSM and WPM models. In this equation, λ is determined by the decision-maker, but when set at 0.5, it offers considerable flexibility.

$$\tilde{k}_{ia} = \frac{\tilde{P}_i + \tilde{S}_i}{\sum_{i=1}^{m}\left(\tilde{P}_i + \tilde{S}_i\right)} \tag{5}$$

$$\tilde{k}_{ib} = \frac{\tilde{S}_i}{\min(\tilde{S}_i)} + \frac{\tilde{P}_{i_i}}{\min(\tilde{P}_i)} \quad (6)$$

$$\tilde{k}_{ic} = \frac{\lambda \tilde{S}_i + (1-\lambda)\tilde{P}_i}{\lambda \max(\tilde{S}_i) + (1-\lambda)\max(\tilde{P}_i)}; 0 \leq \lambda \leq 1 \quad (7)$$

varying the value of λ allows decision making process to test accuracy.

3.2.5 Defuzzification k_{ia} ، k_{ib} و k_{ic}

$$k_{ia} = \frac{k_{ia}^l + k_{ia}^m + k_{ia}^u}{3} \quad (8)$$

$$k_{ib} = \frac{k_{ib}^l + k_{ib}^m + k_{ib}^u}{3} \quad (9)$$

$$k_{ic} = \frac{k_{ic}^l + k_{ic}^m + k_{ic}^u}{3} \quad (10)$$

3.2.6 Rank the Alternatives

The alternative with the highest compromise score (k_i) is considered the most favorable solution.

$$\tilde{K}_i = (\tilde{k}_{ia}\tilde{k}_{ib}\tilde{k}_{ic})^{\frac{1}{3}} + 1/3(\tilde{k}_{ia}\tilde{k}_{ib}\tilde{k}_{ic}) \quad (11)$$

3.3 System Dynamics (SD)

System Dynamics is a modeling approach used to understand and simulate complex, nonlinear systems over time. It uses feedback loops, time delays, and stock-flow structures to map interdependencies among variables. SD is widely used in public policy and organizational planning to test scenarios and predict the long-term impact of different strategies [18].

3.4 Data collection and interpretation method

During the open coding phase, 76 initial concepts were extracted and categorized into 42 subcategories and 24 main categories. These formed the five core dimensions of the study: contextual conditions, causal conditions, intervening conditions, strategies, and outcomes. Data were analyzed using a line-by-line coding approach, moving from conceptual to more abstract levels to determine the conceptual relationships among the categories.

Through in-depth interviews and a review of the literature, the study identified key points related to revenue and expenditure flows and classified initial concepts into overarching categories based on shared features, similarities, and conceptual relationships. The three fundamental components of grounded theory concepts, categories, and propositions were applied, and results were organized into coding result tables. The final model was developed

[DOI: 10.71885/ijorlu-2025-2-700]

by mapping core categories such as causal, contextual, intervening conditions, interactions, and outcomes.

Axial coding: This stage established the connections among categories according to causal, contextual, intervening conditions, strategies, and outcomes [41]. The results of axial coding stemmed from the 76 initial concepts identified during open coding, which were organized into 42 subcategories and 24 main categories.

Selective coding: This process unified the findings and extracted the core theory [32]. The coding procedure followed an interactive approach involving both open and axial coding. After identifying the central category, the final theoretical model was synthesized. For validation, the findings were presented to eight primary participants and five budget experts, whose additional insights were incorporated.

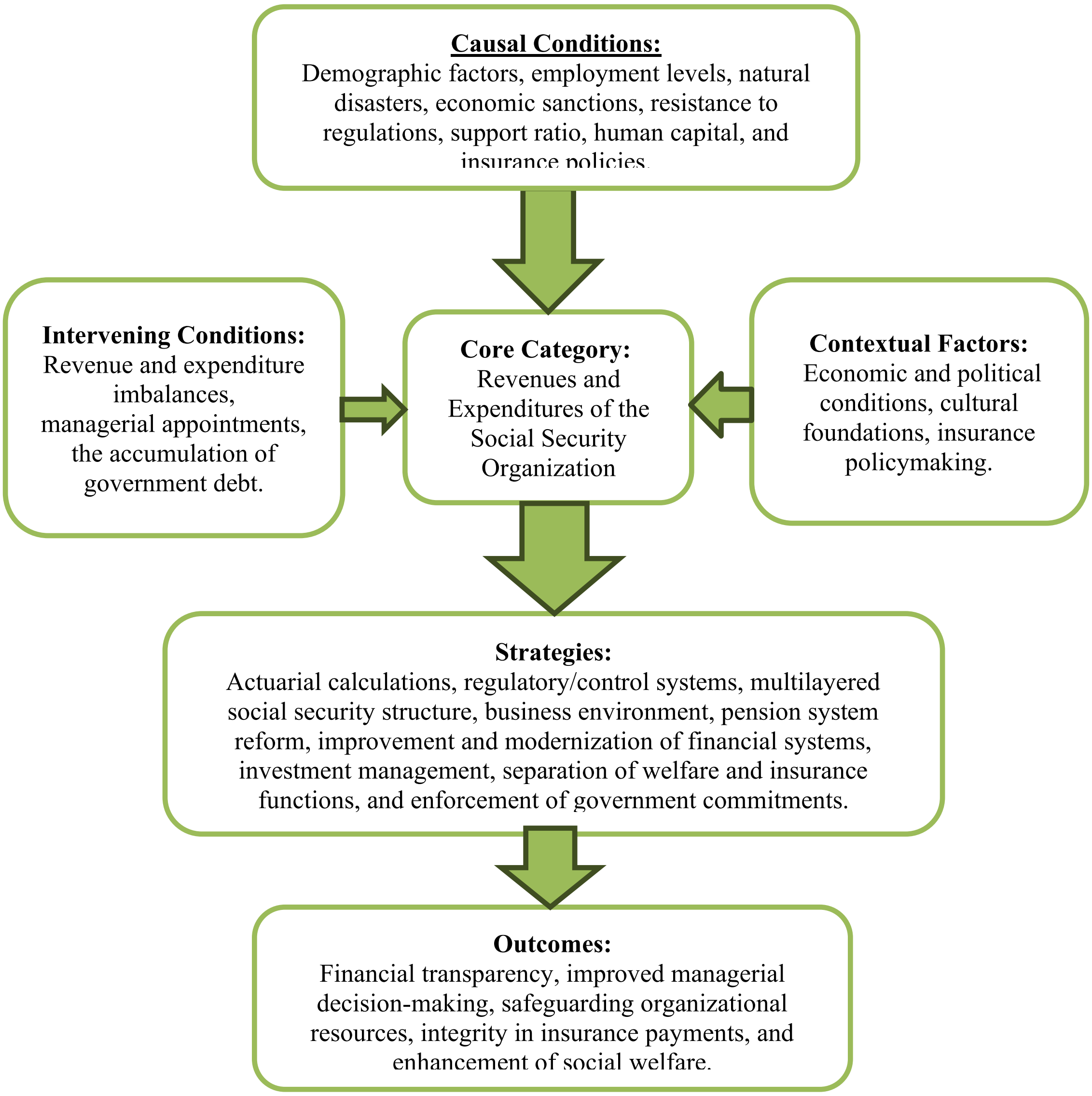

Fig. 1 Grounded theory model (open and axial coding)

In this study, the outcomes of the grounded theory-based interviews were transformed into a structured questionnaire and distributed to experts. After collecting their feedback, the

[DOI: 10.71885/ijorlu-2025-2-700]

responses were converted into fuzzy numbers and used to rank the identified factors and aggregate expert opinions.

4 Ranking of Criteria and Sub-Criteria

4.1 Introduction of Research Factors

In this section, based on a review of the literature and prior research, 24 indicators affecting the revenues and expenditures of the Social Security Organization were identified across five main dimensions. These indicators are presented in Table 3.

Table 3 Introduction of research factors

Sub-criteria codes	Sub-criteria	Criteria	Sub-criteria codes	Sub-criteria	Criteria
D1	Actuarial Calculations		A1	Human Capital	
D2	Separation of Welfare and Insurance Functions		A2	Employment Level	
D3	Improvement and Modernization of Financial Provision Systems		A3	Insurance Policies	
D4	Pension System Reform	Strategies	A4	Support Ratio (Active to Retired)	Causal Conditions
D5	Investment Management		A5	Force Majeure Events	
D6	Regulatory/Control System		A6	Resistance to Oversight Measures	
D7	Enforcement of Government Commitments		A7	Economic Sanctions	
D8	Multi-layered Social Security System		A8	Demographic Factors	
E4	Financial Transparency		C1	Government Debt Accumulation	
		Outcomes	C2	Investment Security	Intervening Conditions,
E5	Integrity in Insurance Payments		C3	Managerial Appointments	
			E1	Strengthening Financial Sustainability	
			E2	Improving Social Welfare	Outcomes
			E3	Enhancing Managerial Decision-Making	

[DOI: 10.71885/ijorlu-2025-2-700]

4.2 Results of the COCO-SO Method for Main Criteria

In this section, the COCOSO method is used to rank the five main criteria. The steps of this method are outlined as follows:

In the first step, the decision matrix is constructed based on expert opinions. The fuzzy decision matrix of the COCOSO method consists of the main criteria and the evaluations of 15 domain experts. Each expert assessed the importance of the criteria using a fuzzy scale ranging from 1 to 5. This decision matrix is presented in Table 4. table 5 demonstrates Fuzzy COCOSO Decision Matrix, and the normalized matrix is shown in Table 6.

Table 4 Expert evaluation matrix for social security criteria

Expert	Causal Conditions	Contextual Factors	Strategic Objectives	Operational Constraints	Expected Outcomes
E1	4	3	5	2	4
E2	5	4	4	3	5
E3	3	2	3	4	3
E4	2	3	4	5	2
E5	4	5	3	2	4
E6	5	4	5	3	5
E7	3	2	4	4	3
E8	2	3	3	5	2
E9	4	5	4	2	4
E10	5	4	5	3	5
E11	3	2	3	4	3
E12	2	3	4	5	2
E13	4	5	3	2	4
E14	5	4	5	3	5
E15	3	2	4	4	3

Table 5 Fuzzy COCOSO decision matrix for main criteria

Factor	Causal Conditions	Contextual Factors	Intervening Conditions	Strategies	Outcomes
E1	(3,5,7)	(7,9,11)	(3,5,7)	(3,5,7)	(1,3,5)
E2	(3,5,7)	(7,9,11)	(7,9,11)	(1,3,5)	(5,7,9)
E3	(1,1,3)	(5,7,9)	(1,1,3)	(1,3,5)	(1,3,5)
E4	(3,5,7)	(5,7,9)	(1,3,5)	(1,3,5)	(1,3,5)
E5	(1,1,3)	(5,7,9)	(5,7,9)	(1,3,5)	(5,7,9)
E6	(5,7,9)	(5,7,9)	(5,7,9)	(5,7,9)	(1,3,5)
E7	(5,7,9)	(5,7,9)	(7,9,11)	(5,7,9)	(1,3,5)
E8	(1,3,5)	(3,5,7)	(3,5,7)	(1,3,5)	(1,3,5)
E9	(5,7,9)	(7,9,11)	(5,7,9)	(5,7,9)	(5,7,9)
E10	(5,7,9)	(5,7,9)	(3,5,7)	(5,7,9)	(5,7,9)
E11	(1,3,5)	(1,3,5)	(5,7,9)	(3,5,7)	(3,5,7)
E12	(5,7,9)	(5,7,9)	(5,7,9)	(5,7,9)	(1,3,5)
E13	(5,7,9)	(5,7,9)	(5,7,9)	(1,3,5)	(1,3,5)
E14	(3,5,7)	(1,3,5)	(1,3,5)	(1,3,5)	(1,3,5)
E15	(1,3,5)	(7,9,11)	(7,9,11)	(3,5,7)	(3,5,7)

In the next step, based on equations (6) and (7), the Weighted Sum (S) and Weighted Power (P) values are calculated. To compute S, the normalized decision matrix is multiplied by the

[DOI: 10.71885/ijorlu-2025-2-700]

weights assigned to each expert. Given the presence of 15 experts in this study, each expert is assigned a weight of 0.067. The row-wise sums of the resulting matrix are then obtained.

To compute P, each element in the normalized matrix is raised to the power of the corresponding criterion weight, followed by calculating the row-wise sums.

The results of these calculations are presented sequentially in Tables 6 through 8.

Table 6 Normalized COCO-SO matrix for main criteria

Factor	Causal Conditions	Contextual Factors	Intervening Conditions	Strategies	Outcomes
E1	(0.2,0.4,0.6)	(0.6,0.8,1)	(0.2,0.4,0.6)	(0.2,0.4,0.6)	(0,0.2,0.4)
E2	(0.2,0.4,0.6)	(0.6,0.8,1)	(0.6,0.8,1)	(0,0.2,0.4)	(0.4,0.6,0.8)
E3	(0,0,0.25)	(0.5,0.75,1)	(0,0,0.25)	(0,0.25,0.5)	(0,0.25,0.5)
E4	(0.25,0.5,0.75)	(0.5,0.75,1)	(0,0.25,0.5)	(0,0.25,0.5)	(0,0.25,0.5)
E5	(0,0,0.25)	(0.5,0.75,1)	(0.5,0.75,1)	(0,0.25,0.5)	(0.5,0.75,1)
E6	(0.5,0.75,1)	(0.5,0.75,1)	(0.5,0.75,1)	(0.5,0.75,1)	(0,0.25,0.5)
E7	(0.4,0.6,0.8)	(0.4,0.6,0.8)	(0.6,0.8,1)	(0.4,0.6,0.8)	(0,0.2,0.4)
E8	(0,0.333,0.667)	(0.333,0.667,1)	(0.333,0.667,1)	(0,0.333,0.667)	(0,0.333,0.667)
E9	(0,0.333,0.667)	(0.333,0.667,1)	(0,0.333,0.667)	(0,0.333,0.667)	(0,0.333,0.667)
E10	(0.333,0.667,1)	(0.333,0.667,1)	(0,0.333,0.667)	(0.333,0.667,1)	(0.333,0.667,1)
E11	(0,0.25,0.5)	(0,0.25,0.5)	(0.5,0.75,1)	(0.25,0.5,0.75)	(0.25,0.5,0.75)
E12	(0.5,0.75,1)	(0.5,0.75,1)	(0.5,0.75,1)	(0.5,0.75,1)	(0,0.25,0.5)
E13	(0.5,0.75,1)	(0.5,0.75,1)	(0.5,0.75,1)	(0,0.25,0.5)	(0,0.25,0.5)
E14	(0.333,0.667,1)	(0,0.333,0.667)	(0,0.333,0.667)	(0,0.333,0.667)	(0,0.333,0.667)
E15	(0,0.2,0.4)	(0.6,0.8,1)	(0.6,0.8,1)	(0.2,0.4,0.6)	(0.2,0.4,0.6)

Table 7 Weighted sum (S) of main criteria

Factor	Causal Conditions	Contextual Factors	Intervening Conditions	Strategies	Outcomes
E1	(0.013,0.027,0.04)	(0.04,0.053,0.067)	(0.013,0.027,0.04)	(0.013,0.027,0.04)	(0,0.013,0.027)
E2	(0.013,0.027,0.04)	(0.04,0.053,0.067)	(0.04,0.053,0.067)	(0,0.013,0.027)	(0.027,0.04,0.053)
E3	(0,0,0.017)	(0.033,0.05,0.067)	(0,0,0.017)	(0,0.017,0.033)	(0,0.017,0.033)
E4	(0.017,0.033,0.05)	(0.033,0.05,0.067)	(0,0.017,0.033)	(0,0.017,0.033)	(0,0.017,0.033)
E5	(0,0,0.017)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0,0.017,0.033)	(0.033,0.05,0.067)
E6	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0,0.017,0.033)
E7	(0.027,0.04,0.053)	(0.027,0.04,0.053)	(0.04,0.053,0.067)	(0.027,0.04,0.053)	(0,0.013,0.027)
E8	(0,0.022,0.044)	(0.022,0.044,0.067)	(0.022,0.044,0.067)	(0,0.022,0.044)	(0,0.022,0.044)
E9	(0,0.022,0.044)	(0.022,0.044,0.067)	(0,0.022,0.044)	(0,0.022,0.044)	(0,0.022,0.044)
E10	(0.022,0.044,0.067)	(0.022,0.044,0.067)	(0,0.022,0.044)	(0.022,0.044,0.067)	(0.022,0.044,0.067)
E11	(0,0.017,0.033)	(0,0.017,0.033)	(0.033,0.05,0.067)	(0.017,0.033,0.05)	(0.017,0.033,0.05)
E12	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0,0.017,0.033)
E13	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0.033,0.05,0.067)	(0,0.017,0.033)	(0,0.017,0.033)
E14	(0.022,0.044,0.067)	(0,0.022,0.044)	(0,0.022,0.044)	(0,0.022,0.044)	(0,0.022,0.044)
E15	(0,0.013,0.027)	(0.04,0.053,0.067)	(0.04,0.053,0.067)	(0.013,0.027,0.04)	(0.013,0.027,0.04)
S	(0.214,0.44,0.699)	(0.413,0.672,0.931)	(0.322,0.564,0.823)	(0.159,0.418,0.677)	(0.112,0.371,0.63)

[DOI: 10.71885/ijorlu-2025-2-700]

Table 8 Weighted Power (P) of Main Criteria

Factor	Causal Conditions	Contextual Factors	Intervening Conditions	Strategies	Outcomes
E1	(0.898,0.941,0.967)	(0.967,0.985,1)	(0.898,0.941,0.967)	(0.898,0.941,0.967)	(0,0.898,0.941)
E2	(0.898,0.941,0.967)	(0.967,0.985,1)	(0.967,0.985,1)	(0,0.898,0.941)	(0.941,0.967,0.985)
E3	(0,0,0.912)	(0.955,0.981,1)	(0,0,0.912)	(0,0.912,0.955)	(0,0.912,0.955)
E4	(0.912,0.955,0.981)	(0.955,0.981,1)	(0,0.912,0.955)	(0,0.912,0.955)	(0,0.912,0.955)
E5	(0,0,0.912)	(0.955,0.981,1)	(0.955,0.981,1)	(0,0.912,0.955)	(0.955,0.981,1)
E6	(0.955,0.981,1)	(0.955,0.981,1)	(0.955,0.981,1)	(0.955,0.981,1)	(0,0.912,0.955)
E7	(0.941,0.967,0.985)	(0.941,0.967,0.985)	(0.967,0.985,1)	(0.941,0.967,0.985)	(0,0.898,0.941)
E8	(0,0.929,0.973)	(0.929,0.973,1)	(0.929,0.973,1)	(0,0.929,0.973)	(0,0.929,0.973)
E9	(0,0.929,0.973)	(0.929,0.973,1)	(0,0.929,0.973)	(0,0.929,0.973)	(0,0.929,0.973)
E10	(0.929,0.973,1)	(0.929,0.973,1)	(0,0.929,0.973)	(0.929,0.973,1)	(0.929,0.973,1)
E11	(0,0.912,0.955)	(0,0.912,0.955)	(0.955,0.981,1)	(0.912,0.955,0.981)	(0.912,0.955,0.981)
E12	(0.955,0.981,1)	(0.955,0.981,1)	(0.955,0.981,1)	(0.955,0.981,1)	(0,0.912,0.955)
E13	(0.955,0.981,1)	(0.955,0.981,1)	(0.955,0.981,1)	(0,0.912,0.955)	(0,0.912,0.955)
E14	(0.929,0.973,1)	(0,0.929,0.973)	(0,0.929,0.973)	(0,0.929,0.973)	(0,0.929,0.973)
E15	(0,0.898,0.941)	(0.967,0.985,1)	(0.967,0.985,1)	(0.898,0.941,0.967)	(0.898,0.941,0.967)
P	(8.372,12.361,14.565)	(12.357,14.569,14.913)	(9.501,13.475,14.753)	(6.488,14.071,14.579)	(4.635,13.96,14.508)

In the fourth step, based on the three evaluation strategies and using equations (7), (8), and (9), the assessment of the criteria is carried out. Each of the five main criteria is evaluated across these three strategic approaches, and the corresponding scores are calculated. The results of this evaluation are presented in Table 10.

$$K_{1a} = \frac{P_i + S_i}{\sum_{i=1}^{m}(P_i + S_i)} = \frac{(8.372,12.361,14.565) + (0.214,0.44,0.699)}{(42.575,70.902,77.079)} = (0.111,0.181,0.359)$$

Table 9 Evaluation scores of main criteria based on strategies

Factor	**Ka**	**Kb**	**Kc**	**Ka defuzzied**	**Kb defuzzied**	**Kc defuzzied**
Causal Conditions	(0.111, 0.181, 0.359)	(3.717, 6.588, 9.37)	(0.542, 0.808, 0.963)	0.217	6.558	0.771
Contextual Factors	(0.166, 0.215, 0.372)	(6.349, 9.133, 11.515)	(0.806, 0.962, 1)	0.251	8.999	0.923

[DOI: 10.71885/ijorlu-2025-2-700]

Intervening Conditions	(0.127, 0.198, 0.366)	(4.921, 7.937, 10.52)	(0.62, 0.886, 0.983)	0.23	7.793	0.83
Strategies	(0.086, 0.204, 0.358)	(2.816, 6.759, 9.175)	(0.42, 0.914, 0.963)	0.216	6.25	0.766
Outcomes	(0.062, 0.202, 0.356)	(2, 6.319, 8.744)	(0.3, 0.904, 0.955)	0.206	5.688	0.72

In the fifth and sixth steps, the final score of each main criterion is calculated based on Equation (11), and the ranking is subsequently determined. This stage aggregates the results of previous strategies into a unified performance index for each criterion. The outcomes of these computations are presented in Table 8.

$$\widetilde{K_\iota} = \left(\tilde{k}_{ia}\tilde{k}_{ib}\tilde{k}_{ic}\right)^{\frac{1}{3}} + 1/3(\tilde{k}_{ia}\tilde{k}_{ib}\tilde{k}_{ic})$$
$$= (0.217 \times 6.558 \times 0.771)^{\frac{1}{3}} + \frac{1}{3}(0.217 + 6.558 + 0.771) = 3.547$$

Based on the results, Contextual Factors ranked first, followed by Intervening Conditions in second place. Causal Conditions obtained the third rank, Strategies came in fourth, and Outcomes ranked fifth.

Table 10 Final scores and rankings of main criteria

Criteria	K	rank
Causal Conditions	4.668	3
Contextual Factors	4.093	1
Intervening Conditions	3.547	2
Strategies	3.422	4
Outcomes	3.15	5

[DOI: 10.71885/ijorlu-2025-2-700]

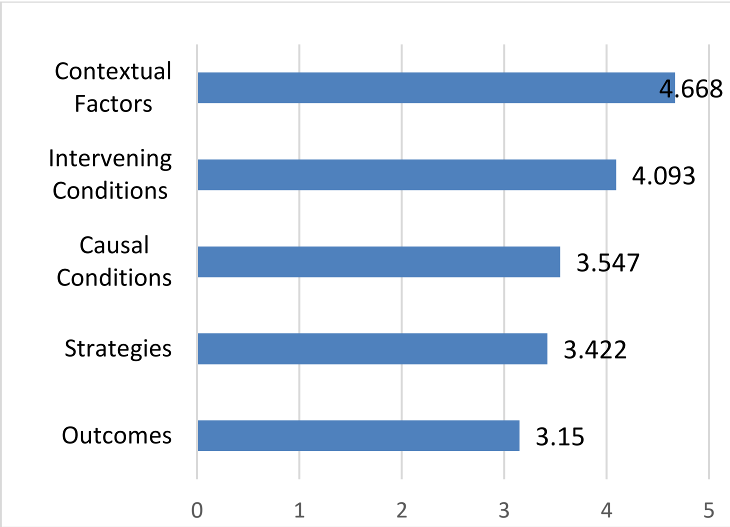

Fig. 2 Final priority of main criteria

4.3 Conceptual model of the system

In this section, the main conceptual system model is described in the form of a subsystem diagram. Each subsystem, which in itself is essentially an independent system, has specific inputs and outputs. It is commonly assumed that a dependency relationship exists between them, with the process acting as an intermediary between input and output. Drawing the subsystem diagram makes it possible to schematically present the overarching model governing the problem, as well as the various variables and their domains of influence allowing the complex interactions between different sectors and domains to be clearly illustrated. The social security domain subsystem, due to its complexity, is divided into two sections: inside and outside the fund. The external subsystems include macroeconomics and government labor and social security policymaking. The internal subsystems comprise the pension system, healthcare system, investments, and the fund's financial performance. Within the external environment, the population subsystem provides data on the labor-ready population to the employees and employers subsystem. It also transfers information regarding primary insurance dependency to the healthcare, coverage, and pension subsystems. The macroeconomic subsystem delivers economic data and conditions to the investment and labor and social policy subsystems. It also provides employment rate data (including job loss and job creation), and per capita income to the government labor and social security policy subsystem, while offering data on minimum annual wages and wage growth to the employees and employers subsystem. Additionally, it communicates overarching rules, regulations, and structures to the fund performance subsystem. Inside the fund, the employees and employer's subsystem send healthcare-related data for covered individuals to the healthcare subsystem; data on those eligible for coverage schemes to the coverage obligations subsystem; and data on those entitled to pensions to the pension subsystem. It also reports the amount of collected insurance contributions based on the number of insured workers and employers to the fund performance subsystem. The healthcare subsystem is primarily connected to the fund performance subsystem, sharing data on the cost of services provided both directly and indirectly as well as the attractiveness of these services. Likewise, the outputs of the coverage and pension subsystems are transferred to the fund performance subsystem. The investment subsystem also links directly to the fund performance subsystem, contributing to the fund's profitability. The *core* subsystem in this model is the fund performance subsystem, as all other subsystems are in some way connected to it. The

[DOI: 10.71885/ijorlu-2025-2-700]

investment, healthcare, coverage, and pension subsystems receive budget information, policies, and strategic guidance from the fund performance subsystem. Additionally, the overall attractiveness of the fund is conveyed to the employees and employer's subsystem from this core system. The causal model of the study regarding the total resources and expenditures of social insurance is as follows:

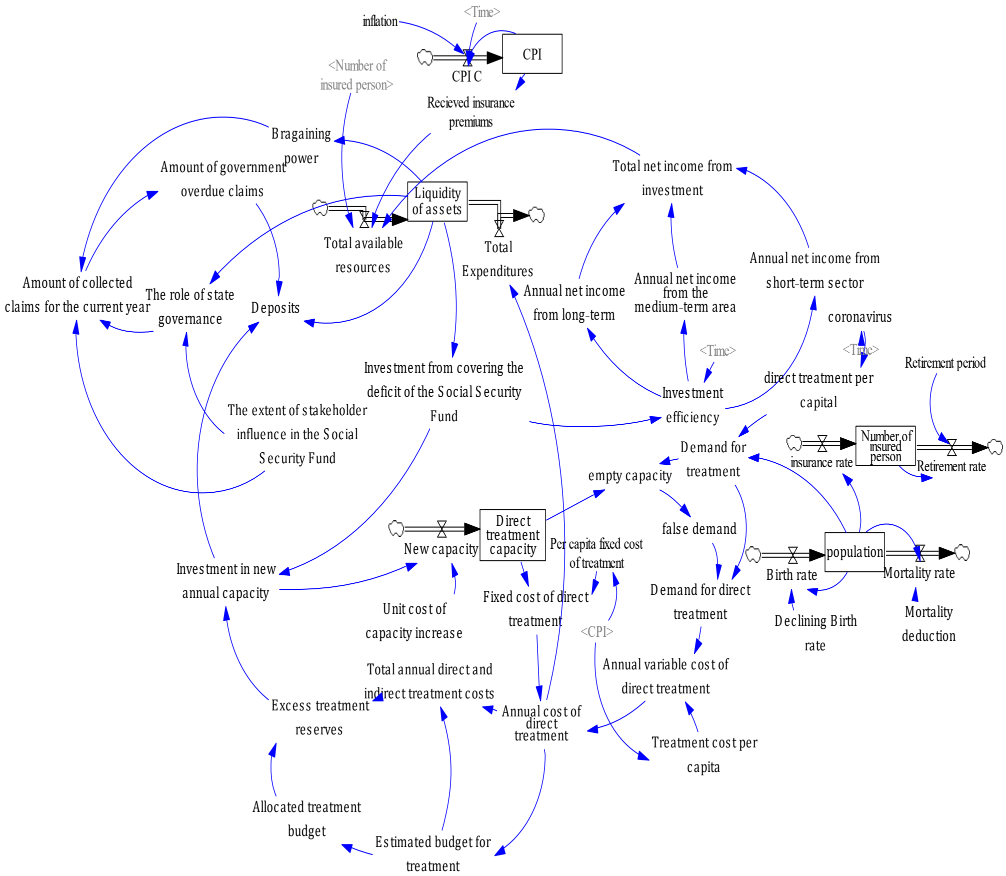

Fig. 3 Research flow-accumulation diagram

4.4 Model validation

After model development and prior to result analysis and scenario building, it is customary to conduct certain validation tests on dynamic system models to ensure their credibility and accuracy under various conditions. In this study, the behavior reproduction method was used for model validation. In this approach, the model-generated values for the target variables are compared with actual observed data. As shown in Figure 4, the values obtained from the simulation and the actual data closely align, indicating the reliability of the developed model.

[DOI: 10.71885/ijorlu-2025-2-700]

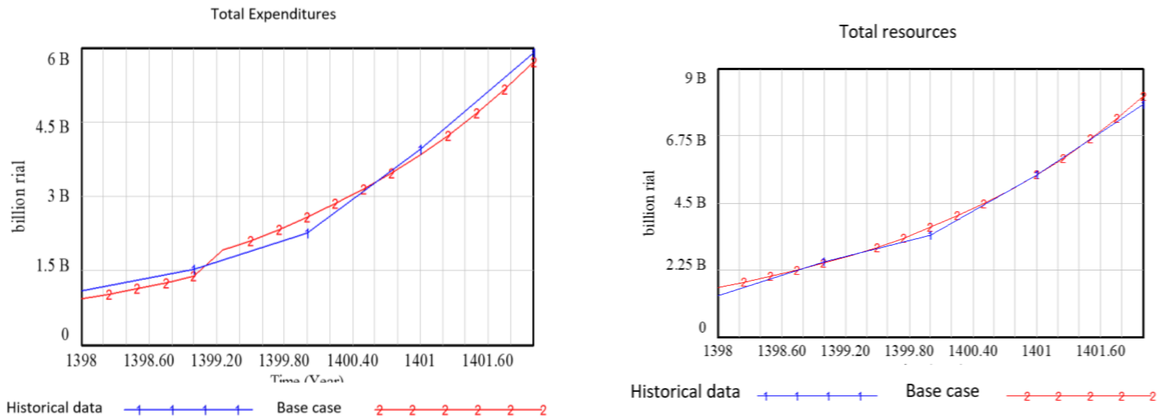

Fig. 4 Validation test of the organization's total resources and expenditures

4.5 Baseline results

In this section, the initial results prior to implementing scenarios are examined. As shown in Figure 5, according to the model's forecast, the country's population will reach 83 million by the year 2033 in the Gregorian calendar. Based on the projections, the number of primary insured individuals in the Social Security Fund will exceed 17 billion, the covered population will reach 70 million, and the number of retirees will surpass 8.2 million. As illustrated in Figure 5, by the year 2033, the Social Security Fund's total resources and expenditures are expected to reach 21.5 quadrillion rials and 12.5 quadrillion rials, respectively.

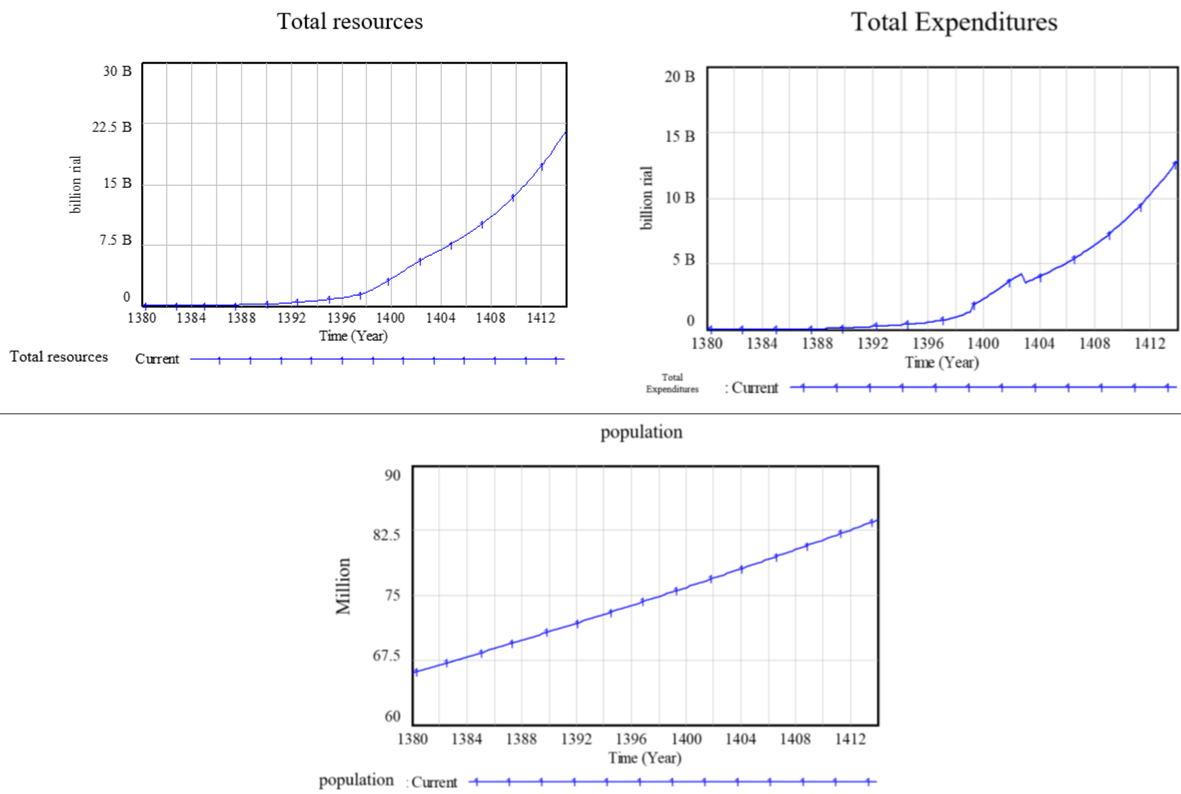

Fig. 5 Validation Test of the organization's total resources, expenditures, and population

[DOI: 10.71885/ijorlu-2025-2-700]

4.6 Results in the policy context

In this section, in order to prevent the excessive growth of expenditures and to ensure proper management of the Social Security Fund's resources, proposed policy measures have been designed and implemented. These policies were derived from expert interviews and literature reviews. In this study, three specific policies have been examined and analyzed.

Table 11 Results in the Policy Context

Row	Scenario Name	Description
1	Gradual Increase in Government-Supported Workshop Insurance Premiums: An annual 1% increase in the insurance premium for government-assisted workshops, starting from the year 2023 and continuing for 10 years until 2033	This policy is intended to increase the financial resources of the Social Security Fund and improve expenditure management.
2	Reducing healthcare costs through direct treatment methods, minimizing healthcare expenditures, and increasing insured individuals' satisfaction	Through the recruitment of skilled and efficient personnel in the medical, nursing, and administrative sectors, and the procurement of appropriate equipment in accordance with ISO standards, which leads to a reduction in healthcare costs.
3	Support for Enterprises to Retain Workforce (Payment of 50% of Unemployment Insurance Benefits)	In this scenario, in order to retain the workforce, 50% of the unemployment benefit will be covered by the Unemployment Insurance Fund and 50% by the employer.

Scenario 1: Gradual Increase in Insurance Premiums for Government-Assisted Workshops
An annual 1% increase in the insurance premium for government-supported workshops, starting from 2023and continuing for 10 years until 2033, based on the growth rate of insured individuals and annual wage increases. According to the insured population table from 2023 to 2033, this policy is projected to generate a positive financial impact of 245,000 billion rials annually.

Scenario 2: Reducing Healthcare Costs through Direct Treatment and Efficiency Measures
This strategy aims to minimize healthcare expenditures and enhance insured individuals' satisfaction by recruiting skilled and efficient personnel in medical, nursing, and administrative sectors, and by procuring appropriate equipment in line with ISO standards. According to projections, this policy will gradually reduce healthcare costs and result in a positive impact of 32 trillion rials by 2033.

Scenario 3: Supporting Enterprises to Retain Workforce (50% Unemployment Benefit Co-Payment)
In this scenario, to help retain human resources, 50% of the unemployment benefit is covered by the Unemployment Insurance Fund and 50% by the employer. Additionally, part of the costs will be reimbursed by the government. This shared-cost approach is expected to create optimal

[DOI: 10.71885/ijorlu-2025-2-700]

conditions for the unemployment insurance fund, with its balance gradually increasing to approximately 13 trillion rials by 2033.

5 Conclusion

This study aims to design a hybrid model of the Social Security Organization's resources and expenditures and to rank the influencing factors. The research draws on literature review, library studies, and expert opinions, employing a grounded theory approach and multi-criteria decision-making methods. After conducting open, axial, and selective coding, the findings were categorized into five main themes: contextual conditions, intervening conditions, causal conditions, consequences, and strategies. Accordingly, all financial challenges related to the Social Security Organization can be classified under these five categories. all five components have influenced the imbalance between the Social Security Organization's resources and expenditures. This study aimed to design a hybrid model of the Social Security Organization's financial flows and to rank the contributing factors. Drawing on literature review, expert interviews, and grounded theory methodology combined with multi-criteria decision-making, the study categorized findings through open, axial, and selective coding into five main dimensions: contextual conditions, intervening conditions, causal conditions, consequences, and strategies. Accordingly, all financial challenges facing the organization can be classified under these five categories.

Among these, contextual conditions were identified as the most influential factor, based on expert opinion and fuzzy COCOSO analysis. These include socioeconomic factors, overarching insurance-related policies, and flawed cultural foundations that were implemented without adequate infrastructure leading to failure.

The second most influential factor is intervening conditions. Experts emphasized the need to update the organization's regulations, reduce complexity, and enhance transparency. One way to achieve this is through information disclosure or direct legislation mandating data production and reporting.

The third factor, causal conditions, directly affects the organization's financial balance. It relates to accountability in managerial oversight, task execution, and proper use of financial resources. Supervisory bodies and stakeholders are expected to monitor the performance of the board and managers, ensuring transparency in program implementation and expenditure allocation. Accountability here means accepting responsibility for outcomes and clearly communicating how promised support is delivered to stakeholders. From their perspective, effective use of contributions and fair returns are of high importance. Experts also emphasized that the support expected by stakeholders must be comprehensive and adequate.

Strategies were identified as the fourth influential factor. Transparency enhances integrity, cohesion, and competence, while preventing mismanagement and inefficiency. Timely and clear information facilitates inspection and accounting processes, supports decision-making, and helps reveal conflicts of interest through predefined performance metrics.

Finally, consequences were the fifth factor. One of the most critical outcomes is financial stability, which refers to avoiding financial crises or operational failures. Instability arises when the financial system becomes vulnerable to economic shocks. Ensuring financial stability is essential for the organization to meet its short- and long-term obligations, particularly in securing retirees' income.

[DOI: 10.71885/ijorlu-2025-2-700]

The successful implementation of these strategies requires active collaboration among the government, the Social Security Organization, employers, and society at large. Such a coordinated approach can lead to a more resilient and equitable social protection system.

To improve the effectiveness and sustainability of the Social Security Organization, several strategic reforms are essential. First, optimizing human resources by streamlining staffing levels and assigning personnel based on skills and organizational needs can enhance efficiency and reduce operational overhead. Concurrently, establishing an integrated reporting system that unifies data flows across insurance, healthcare, and investment departments will facilitate coordination, reduce redundancies, and improve decision-making. In addition, promoting financial transparency through real-time reporting and public disclosure mechanisms is crucial for mitigating fraud, bolstering institutional integrity, and strengthening stakeholder trust. Lastly, the expansion of insurance coverage to include flexible, adaptable plans aligned with the evolving landscape of digital and knowledge-based professions ensures broader social protection and responds proactively to labor market shifts driven by innovation.

To enhance the efficiency and sustainability of healthcare systems particularly within social security frameworks a multi-pronged cost optimization strategy is essential. First, conducting comprehensive cost analyses allows organizations to pinpoint inefficiencies and eliminate unnecessary expenditures, ensuring that resources are allocated where they yield the greatest value. Second, promoting the use of cost-effective medications those that offer similar therapeutic outcomes at lower prices can significantly reduce pharmaceutical spending without compromising care quality. Third, expanding remote healthcare services such as telemedicine and virtual consultations not only lowers operational costs but also improves access, especially in underserved areas. Fourth, centralizing treatment services by consolidating facilities and streamlining logistics can cut down on redundant infrastructure and transportation expenses. Finally, investing in preventive health programs including wellness initiatives and early disease detection can reduce the long-term burden of chronic and high-cost conditions by addressing health issues before they escalate. Together, these strategies form a cohesive framework for reducing costs while maintaining or even improving the quality of care.

To strengthen the financial resilience of social security systems, a multifaceted approach is essential one that blends innovation, inclusivity, and strategic oversight. First, revenue diversification through investment in productive economic ventures and sustainable natural resource development can reduce overreliance on payroll contributions and buffer against economic shocks. Second, fostering public participation by leveraging crowdfunding platforms and public-private partnerships not only mobilizes capital but also enhances community ownership and trust in the system. Finally, adopting modern financial management strategies such as strategic planning, risk-based budgeting, and data-driven investment decisions can significantly improve cost efficiency and long-term returns5. Together, these pillars form a robust financial architecture that supports both short-term solvency and long-term sustainability. Let me know if you'd like this turned into a policy brief or visual summary.

5.1 Research limitations

This study faced several limitations that should be acknowledged. First, the complexity of the dynamic modeling process demanded advanced expertise in mathematics, economics, and computer science, which constrained the inclusion of certain technical components and led to the simplification of some model elements. Second, restricted access to internal organizational data due to confidentiality and security concerns limited the depth of empirical validation and

[DOI: 10.71885/ijorlu-2025-2-700]

the comprehensiveness of the analysis. Third, institutional conflicts of interest among various departments within the Social Security Organization created barriers to full data sharing and collaborative interpretation, thereby affecting the integration of insights across functional areas. These limitations highlight the need for greater interdisciplinary collaboration, transparent data governance, and organizational alignment in future research efforts.

References

1. Jassem, S., Zakaria, Z., & Che Azmi, A. (2022). Sustainability balanced scorecard architecture and environmental performance outcomes: a systematic review. International Journal of Productivity and Performance Management, *71*(5), 1728-1760.
2. Palley, T. I. (2018). Re-theorizing the welfare state and the political economy of neoliberalism's war against it (No. 16). FMM Working Paper.
3. Esping-Andersen, G. (2000). The sustainability of welfare states into the twenty-first century. *International Journal of Health Services*, *30*(1), 1-12.
4. De Vogli, R. (2014). The financial crisis, health and health inequities in Europe: the need for regulations, redistribution and social protection. *International Journal for Equity in Health*, *13*(1), 58. doi: 10.1186/s12939-014-0058-6
5. OECD (2011), Divided we stand: why inequality keeps rising, oecd publishing. http://dx.doi.org/10.1787/9789264119536-en
6. Hemerijck, A. (2012). When changing welfare states and the Eurocrisis meet. Sociologica, 6(1), 1-51. https://doi.org/10.2383/36887
7. Clasen, J. (2011). Regulating the risk of unemployment: National adaptations to post-industrial labour markets in Europe. Oxford University Press.
8. ILO. (2012). Social security for all: Building social protection floors and comprehensive social security systems–The strategy of the International Labour Organization.
9. Çelik, A., & Yavuz, K. (2023). The Evolving Role of the State in the 15th Year of Türkiye Social Security System Reform. *Sosyal Siyaset Konferansları Dergisi*, (84), 111-124. doi: 10.26650/jspc.2023.84.1274542
10. Mohagheghzadeh, M., Daman Keshideh, M., Momeni Vesalian, H., Afsharirad, M., & Daghighi Asli, A. (2021). Evaluation of the Sustainability of the Pension System: A Case Study on Iranian Social Security Organization. *Social Welfare Quarterly*, *20*(79), 305-332.
11. Popovic, T., Kraslawski, A., Barbosa-Póvoa, A., & Carvalho, A. (2017). Quantitative indicators for social sustainability assessment of society and product responsibility aspects in supply chains. *Journal of International Studies*, *10*(4).
12. Alipour, A., Beshkooh, M., & Kordestani, G. (2021). Identify and present the model of challenges of the Social Security Organization in the field of resources and expenditures. *Journal of Management Accounting and Auditing Knowledge*, *10*(37), 315-324.
13. Ahmadvand, L., Soufimajidpour, M., & Mahmoudzadeh, M. (2023). Effects of monetary and fiscal policies on the expenses of the Social Security Organization. *Iranian Journal of Health Insurance*, *6*(3), 189-196. http://journal.ihio.gov.ir/article-1-287-fa.html(In Persian).
14. Zaroki, S. and Yadollahi Otaghsara, M. (2021). Analysis of Factors Affecting the Lost Resources of the Social Security Organization in Iran. Stable Economy Journal, 2(3), 110-131. doi: 10.22111/sedj.2021.40719.1167(In Persian).
15. Baumgartner, R. J. (2014). Managing corporate sustainability and CSR: A conceptual framework combining values, strategies and instruments contributing to sustainable development. Corporate Social Responsibility and Environmental Management, 21(5), 258-271.
16. Mani, k. (2022). Relationship between social organization insurance expenditures, unemployment insurance fund and economic growth in Iran. Journal of Iranian Economic issue, 8(2), 277-304. (In Persian).
17. Keefe, H. G. (2020). The impact of exchange rate volatility on inflation targeting monetary policy in emerging and advanced economies. *International Finance*, *23*(3), 417-433.
18. Mortazavi Saraee, K., Mahmoudzadeh, M., & Izadbakhsh, H. (2022). The Application of the Dynamic Model Approach in Social Insurance Funds in Terms of the Consequences of the Corona Epidemic; A Case Study of Social Security Organization of Iran. *Iranian Journal of Health Insurance*, *5*(2), 118-128. SID. https://sid.ir/paper/1022268/en

[DOI: 10.71885/ijorlu-2025-2-700]

19. Krennerich, M. (2014). Social security–just as much a human right in developing countries and emerging markets. Verfassung und Recht in Übersee/Law and Politics in Africa, Asia and Latin America, 25(5), 105-123. https://doi.org/10.1504/IJMP.2019.10017273
20. Musalem, A. R., & Ortiz, M. D. (2011). Governance and social security: Moving forward on the ISSA good governance guidelines. International Social Security Review, 64(4), 9-37.
21. Kimiagari, A., & Manuchehri Rad, R. (2011). Income redistribution in IRAN's social security fund and the effect of inflation on it. Iranian Journal of Economic Research, 15(45), 139-180. (In Persian)
22. Akash,T.R., Reza,J., Alam,A.(2024) Evaluating financial risk management in corporation financial security systems. World Journal of Advanced Research and Reviews, 23(01), 2203–2213
23. Du, X., Wei, H., & Zhang, X. (2024). Implications for household health expenditure in China's ageing population: based on Red Herring hypothesis. *BMC Public Health*, *24*(1), 2984. doi: 10.1186/s12889-024-20422-y
24. Ilcheva, M. (2023). APPLICATION OF SOCIAL INNOVATIONS FOR IMROVEMENT OF SOCIAL SECURITY IN BULGARIA. Knowledge-International Journal, 59(1), 77-82.
25. Ebrahimi Daneshmand, S., Mojibi, T., Mehdizadeh, A., & Gholamaberi, A. (2022). Developing A Model for Measuring the Performance of the Health System Based on the Balanced Scorecard (BSC) Method in Social Security Organization. *Iranian Sociological Review*, *12*(2), 65-72. doi: 10.30495/IJSS.2022.20080.
26. Tadayyon, M.M., & Etemadi, M. (2022). General Social Security Policies: A Toolbox for Reforming the Health Financing System in Iran. Iranian Health Insurance Journal, 5(2), 78–85
27. Mehdipoor, S. (2019). Restoring Sustainability of Public Pensions Via Optimal Parametric Reforms. *Social Security Journal*, *14*(4), 67-86.
28. Godínez-Olivares, H., del Carmen Boado-Penas, M., & Haberman, S. (2016). Optimal strategies for pay-as-you-go pension finance: A sustainability framework. *Insurance: Mathematics and Economics*, *69*, 117-126.
29. Godínez-Olivares, H., Boado-Penas, M. D. C., & Pantelous, A. A. (2016). How to finance pensions: Optimal strategies for pay-as-you-go pension systems. *Journal of forecasting*, *35*(1), 13-33.
30. Raghfar, H., & Akbarbeygi, S. (2015). The Effect of Replacement Rate Changes in Social Security Pension Fund on the Capital Stock, Labor Supply and Saving.
31. De la Fuente, Á., & Doménech, R. (2013). The financial impact of Spanish pension reform: A quick estimate. *Journal of Pension Economics & Finance*, *12*(1), 111-137. doi: 10.1017/S1474747212000182
32. Christian, M. (2012). Demographic dynamics and sustainability of public pension expenditures within EU-15 member states. *Annals of the University of Resita*, 4(1), 215–228. https://www.utgjiu.ro/revista/ec/pdf/2012-04.I/28_MILOS%20Marius%20Cristian.pdf
33. Zonetti, A., & Biltexi, V. (2011). Fiscal projections for the pension system of Belarus. *World Bank Technical Report*. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/691161468005684810
34. Jimeno, J. F., Lamo, A., & Christopoulou, R. (2010). Changes in the wage structure in EU countries: Implications for pension expenditures. *ECB Working Paper No. 1199*. https://www.econstor.eu/bitstream/10419/153633/1/ecbwp1199.pdf
35. Dashtban Faroji, Majid, Samadi, Saeed, Dallali Isfahani, Rahim, & Abdollahe Milani, Mahanosh. (2011). Pension System Reform and it's Effects on Income Distribution, Poverty and Capital Accumulation: an Application for Iran. Journal of Economic Essays, 7(14), 117-151. https://sid.ir/paper/108880/en .
36. Sin, Y. (2005). Pension debt and reform options for elderly insurance in China. *World Bank Policy Research Working Paper*, 3575. https://documents1.worldbank.org/curated/en/653441468141298551/pdf/331160CHA0Working0paper0P0583080Pension.pdf
37. Akwimbi, J., & Julius, M. (2005). Evaluating the financial sustainability of social security schemes in Kenya. *Kenya Institute for Public Policy Research and Analysis*. http://dx.doi.org/10.2139/ssrn.776404
38. Haberman, S., & Zimbidis, A. (2002). An investigation of the pay-as-you-go financing method using a contingency fund and optimal control techniques. *North American Actuarial Journal*, *6*(2), 60-75.
39. Disney, R. (2000). Crises in public pension programmes in OECD: What are the reform options? *The Economic Journal*, *110*(461), 1-23. doi: 10.1111/1468-0297.00509
40. Pampel, F. C., & Williamson, J. B. (1985). Age structure, politics, and cross-national patterns of public pension expenditures. *American Sociological Review*, 782-799. https://doi.org/10.2307/2095504
41. Strauss, A – Corbin, J. (1998), Basics of Qualitative Research: Grounded Theory, Procedures and Techniques, 2nd edition, Thousand Oaks CA Sage.
42. Ulutaş, A., Popovic, G., Radanov, P., Stanujkic, D., & Karabasevic, D. (2021). A new hybrid fuzzy PSI-PIPRECIA-CoCoSo MCDM based approach to solving the transportation company selection problem. Technological and Economic Development of Economy, 27(5), 1227-1249.

[DOI: 10.71885/ijorlu-2025-2-700]

43. Dixon, J., & Hyde, M. (2002). Marketization of social security: a cross-national perspective: introduction to the symposium. The Review of Policy Research, 19(3).
44. Kapar, R. (2015), "Uluslararası Çalışma Örgütü'nün Sosyal Koruma Tabanları Yaklaşımı", Karatahta İş Yazıları Dergisi, Nisan, S. 1, 181-209.

[DOI: 10.71885/ijorlu-2025-2-700]