



Barriers and Solutions to Implementing Iran's Human Resource Ecosystem: A Mixed Methodology based on Total Systems Intervention

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ABSTRACT

Implementing the human resources ecosystem poses a significant challenge for large private and public organizations. This challenge is exacerbated by the comprehensive nature of its concepts and its dependence on the availability of rich and abundant resources. The primary objective of this research is to scrutinize the barriers hindering the implementation of the human resources ecosystem in Iran, considering the prevailing environmental conditions. The secondary goal is to propose viable steps for resolving these problems and overcoming the barriers through a comprehensive understanding of the challenges associated with implementing this ecosystem. The Total Systems Intervention (TSI) meta-methodology system was selected to achieve a holistic understanding of the system. Deploying the Total Systems Intervention framework, a systematic process was initiated to identify the system's principal challenges and pinpoint applicable methods. Nine main challenges were identified, leading to the selection of two methods—namely, the Importance-Performance Approach (IPA) and the Soft Systems Methodology (SSM)—for categorization and the development of implementation solutions. The findings, based on the perspectives of seven experts in the field of human resources, revealed that non-compliance with strategic plans with the human resource ecosystem and environmental dynamism and uncertainty are the most crucial and impactful barriers. Consequently, issues such as the lack of executive flexibility and insufficient stakeholder participation were identified as additional problems of high importance but lower effectiveness. Subsequently, the research delved into discussing methods for implementing and monitoring the ecosystem, resulting in the design of a comprehensive framework for implementation. The research underscores that successfully implementing the human resources ecosystem necessitates internal system integration and alignment among managers, stakeholders, programs, and resources. This alignment accelerates and streamlines the implementation process, highlighting the importance of a cohesive approach to realizing the system's potential.

Keywords

Human resources ecosystem, Problem solving, Systems thinking, Soft systems methodology, Total systems interventions.

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1. Introduction

The Human Resources (HR) ecosystem creates a living and dynamic environment consisting of people, processes, technologies, and other stakeholders active in human resources activities that interact and exchange with each other and affect the surrounding environment (Garavan et al., 2019). The HR ecosystem is divided into seven parts: recruitment and selection, performance management, learning and development, succession planning, compensation and benefits, human resources information systems, and human resources data analysis; each of these parts should interact constructively and dynamically with each other and improve the human resource management system in organizations (Donnelly and Hughes, 2022). The environmental changes in organizations, such as the development of technologies, knowledge-centered organizations, and evolution in the concept of work and specialization, have caused traditional human resource management to no longer meet the organization's needs. By not considering and adapting to these developments, it cannot be believed that human resource management can have a suitable function for the organization in the current and future conditions (Amelia, 2018), and the concept of human resource management needs to be changed and recreated towards the human resource management ecosystem. So that resource management can perform its tasks while adapting to traditional and environmental changes and take the necessary measures to improve the current human resources system (Dharmasiri, 2015).

Regarding the current state of the human resources ecosystem in the country, it can be said that now those involved in management issues have realized, with the help of existing knowledge and experience, that most of the difficulties of organizations and their managers are directly or indirectly related to human resources issues (Asadi et al., 2022). In fact, in developing and underdeveloped countries, although they have sufficient and sometimes abundant physical and natural capital, they face countless problems due to the lack of attention to human capital and the lack of development of their human resources. The correct use of human resources also requires workforce planning, efficient organizational structure, and matching of jobs and employees so that the organization does not suffer from slowness, mismanagement, incomplete employment, lack of motivation, and incompetence of employees (Fuller et al., 2019).

In terms of achieving the desired state of human resources management through the human resources ecosystem in organizations, it is possible to plan strategic human resources at the national level and coordinate the human resources structure of the organizations with it,

significantly reducing the unemployment rate, modernizing the classification and evaluation structure (Donnelly and Hughes, 2022; Wieland et al., 2023). Clear job descriptions and certification requirements are necessary for specific jobs. Concurrently there is a growing trend in employee education levels and organizational structure revisions that favor unique structures, work groups, decentralization, and integration of unit responsibilities, particularly in the human resources management unit (Malik et al., 2022). Also, creating a salary structure based on the performance and effort of individuals and also based on the labor market situation in order to attract capable job seekers, creating flexibility in working hours and the workplace in order to make better use of specialists, strengthening the culture of participation and democracy for attracting the support of employees from the organization and finally paying attention to the individual motivations of employees in career success through the establishment of a career growth path to provide future managers of organizations are other suggestions (Yalenios and d'Armagnac, 2022).

In this regard, the World Economic Forum emphasized the latest official report on the state of human capital in different countries, published in 2017 (Figure 1). Despite technological advancements, a significant portion of the global human capital reserve remains underutilized, with only 62% being effectively harnessed. The report allocates Iran 54.97 points out of 100, ranking it 104th out of the 130 countries surveyed on the Human Capital Index. This score places Iran below several lower-income countries, including Tajikistan, the Philippines, Ghana, and Cameroon. In the context of the Middle East, Iran ranks 11th out of the 12 countries examined.

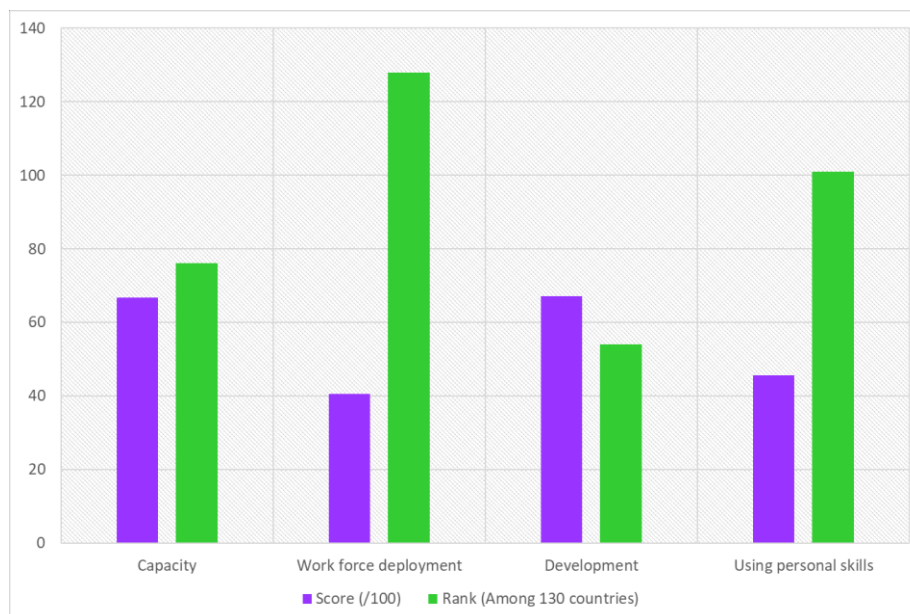


Figure 1. Iran's score and ranking, according to human capital sub-indices (source: Fraumeni and Liu, 2021).

A general look at the hiring process in companies in Iran's industries shows that no process has been defined for the entry of human resources into companies (Nafari and Rezaei, 2022), which is considered one of the main factors of the human resource challenge throughout the world (Sawan et al., 2021). The fundamental definition of the recruitment process depends on the entry of ineffective people into the organization. Providing human resources and recruiting forces requires scientific and principled research and needs assessment (Martinez, 2016). Recruiting forces without a proper needs assessment will cause the entry of inefficient forces or placement of efficient forces in the wrong position and, as a result, waste the forces' strength and the company's potential. Iran's industries, as one of the custodians of industrial development, play an essential role in this field, which can help the growth of industries by implementing the human resource ecosystem (Khoshmaram et al., 2020).

In addressing the complexities of the human resources (HR) ecosystem in the context of Iranian organizations, our research seeks to delve into crucial questions surrounding the design and assumptions underpinning this ecosystem for stakeholders. Specifically, it aims to identify the primary beneficiaries of the system and unravel the key assumptions essential for its optimal design and implementation. In order to adequately address these questions, the study will critically review the body of literature, identifying gaps in authors' knowledge of HR ecosystems and highlighting new perspectives. Subsequently, this study will explore the methodologies employed to answer our research questions, implementing selected methods to gather pertinent data. The analysis of results will provide valuable insights into the intricate landscape of the HR ecosystem in Iran, shedding light on essential assumptions, beneficiaries, and practical implementation strategies.

2. Literature review

The term "ecosystem" was coined in 1930 by Roy Clapham to denote the physical and biological components of the environment and their relationship with each other. English ecologist Arthur Tansley described the term ecosystem as a system of interactions between biocenes (a group of living organisms) and their biotope (the environment in which they live). Tansley directly emphasized the link between biotic and abiotic components (Burke and Morley, 2022). Therefore, the word ecosystem is derived from the science of biology, combining the two words ecology and system (De Stefano et al., 2018). Therefore, the ecosystem is a concept that integrates plant and animal environments, population dynamics, behavior, and evolution (Sawan et al., 2021). The ecosystem approach studies the hypotheses

of human behavior in the framework of interactions between people and their environments (Hu et al., 2022). There are differences among the definitions of the ecosystem, and branches have also been inferred from these differences. However, all definitions generally have three common characteristics: 1. living elements, 2. inanimate elements, and 3. their interaction. The European Quality Management Foundation states that organizations must adequately understand their ecosystem and its place in it (Zaharov and Lobacheva, 2020).

The human resource ecosystem has become popular since the 1980s with the introduction of two models under the titles of the adaptive model and the Harvard model, which focused on integrating strategy and human capital (Tajpour and Hosseini, 2019). Creating a human resource ecosystem ensures the organization has skilled, committed, and motivated employees to strive for sustainable competitive advantage (Mauro and Borges-Andrade, 2020). The logic of the human resources ecosystem is based on presenting and agreeing on the design of methods for managing employees in the long term. This logic forms the basis of achieving a competitive advantage through the human resources ecosystem. In this way, it defines the goals and plans of the organization on how to achieve business goals through employees (Ma and Zhang, 2020).

The human resource ecosystem is a network of actors whose success and survival depend on each other. This concept states that organizations should not be considered separate actors but part of an ecosystem (Meijerink and Keegan, 2019). Ecosystem refers to elements, people, organizations, or institutions that can act as a stimulus or obstacle for companies to enter international markets. Such an ecosystem includes hundreds of elements grouped in different domains (Stone et al., 2020). The human resource ecosystem is a new way of thinking and acting for developing human resources and their successful entry into industries. All necessary systems are considered in their development and how they interact with each other (Melisa et al., 2013). To understand its ecosystem, an organization must know and understand the following components:

Organization: The organization itself is at the center of an organization's ecosystem. In an organization, important components must be defined correctly: A: Organizational leadership, B: Foundation/existential philosophy of the organization, C: Organizational strategy, D: Organizational culture, e: management structure of the organization, and: promotion of organizational performance and transformation (Zakharov et al., 2021).

Stakeholders: Stakeholders are individuals, groups, or organizations that directly or indirectly have a role or benefit in that organization because they either affect or are affected by the organization. External stakeholders are partners and suppliers (Khazaei et al., 2023), society,

shareholders (Taghipour et al., 2023a), employees, customers, and government institutions (Nayeri et al., 2022). Some challenges and opportunities are obtained through interaction with the stakeholders (Ang et al., 2011).

Market/competition scene: The market is a collection of actual and potential customers, which practically becomes a competition scene due to the presence of competitors and other actors. Actors such as competitors, potential customers, new entrants, media and social networks, innovations, laws, human resources, special interest groups, and intermediaries are usually present in this scene. Some challenges and opportunities are created in the market and competition scene. Organizations must continuously create sustainable value to survive and grow in the market (Alfes et al., 2021).

Global environment Supertrends: The global environment is a relatively distant and macro environment in which organizations are more affected by its components, and these components, in turn, can determine a part of the opportunities and challenges of an organization (Taghipour et al., 2023; Ehsanifar et al., 2023). The changes that occur in the global environment have long-term effects. The time they can have is also called supertrends (Lim et al., 2020).

Based on the stated content, the previous research in this field will be reviewed, and during this review, it will be determined how the existing gap in the literature is in Table 1.

Table 1. Research background.

	Reference	Research objectives	The result of the research
1	Zakharov et al., 2021	Investigating ecosystems in personnel management in the digital economy	The results showed that it is an ecosystem formed and developed in large Russian banking organizations. Organizations must use partner companies' services to form and develop the human resources ecosystem.
2	Wang and Zhu, 2017	Investigating the impact of green human resource management on the entrepreneurial ecosystem, investigating the impact of green human resource management on green thinking, investigating the impact of green human resource management on sustainable development, investigating the impact of green human resource management on globalization	The characteristics of the zero-sum game in traditional models were analyzed, and the health of ecosystems was used to evaluate the competitiveness of species and the advantages of harmonious coexistence in order to evaluate companies and marine workers. The evaluation model is created throughout the ecosystem based on the evaluation of maritime companies and employees.
3	Ma and Zhang, 2020	Evaluating and regulating the health of the human resource ecosystem	The perspective of the human resource ecosystem helps organizations pay attention to the human resource management system as a dynamic system, and this dynamic should be created between human resource management processes such as recruitment, recruitment, training, and maintenance with the external environment.
4	Snell and Morris, 2021	Determining the processes of the human resources ecosystem, determining the operational strategies of the human resources ecosystem	The research findings show 18 dimensions for the deployment model of the human resource management ecosystem. Research results indicate the influence of green human resources management on the ecosystem of

	Reference	Research objectives	The result of the research
			entrepreneurship, green thinking, sustainable development, and globalization.
5	Meijerink and Keegan, 2019	Regulating human resource ecosystems through alignment of exchanges; Determining the landscape in human resource ecosystems of the gig economy	The perspective of the human resource ecosystem helps organizations pay attention to the human resource management system as a dynamic system, and this dynamic should be created between human resource management processes such as recruitment, recruitment, training, and maintenance with the external environment.
6	Garavan et al., 2019	An ecosystem perspective on international human resource development, providing a framework for implementing the human resource ecosystem	They have provided a framework in this area that includes interdependence, power center, bargaining power, and relationships between employees and managers, which will develop human resources at the international level.
7	Sawan et al., 2021	Determining the environmental factors affecting the determination of strategies, those in charge of recruiting and providing human resources, and human resource planning based on industry job competencies	Determining the right number of people, technical knowledge, group orientation, evaluation of professional competencies, legal requirements, implementation of the recruitment process, employee empowerment and fairness in attracting human resources and the factor of competition in each of the dimensions affecting employment have been given the highest priority.
8	Amelia, 2018	Determining competency criteria, matching competencies with jobs, human resource recruitment measures, human resource supply measures, and internal and external consequences, prioritizing these factors	Digital Human Resources presents case studies and detailed interviews with HR managers of large multinational companies and provides comprehensive empirical evidence for academics and students interested in human resource development in today's digital environment. This book will also be valuable for managers who want to adapt to the role of human resources in their companies or organizations.
9	Martinez, 2016	Developing human resources in the digital space, adapting the ecosystem of human resources to e-commerce	Human resource management functions positively and significantly affect the ecosystem for the companies studied. Also, the function of providing human resources, the function of training human resources, the function of improving the quality of relationships, the function of creating value, and the function of performance evaluation have a positive and significant effect on the human resources ecosystem.
10	Dharmasiri, 2015	Determining the functions of human resources management on the ecosystem, the function of improving the quality of relationships, the function of creating value, and the function of evaluating performance in the human resources ecosystem.	This research includes 10 main components in the human resources ecosystem: targeting, attraction, training, growth, career path, maintenance, talent management, reward, succession, and employee satisfaction, which organizations should consider.
11	Malik et al., 2022	Examining the ecosystem of human resources in the electronics industry; Identifying the components of the human resources ecosystem	It should be noted that the ecosystem approach is an obstacle in the way of other management and protection methods such as Biosphere reserves, protected areas, and single species protection programs or other methods that are carried out under national policies and legal frameworks are not. Instead, this approach can integrate all other approaches and methods to deal with complex situations.

Examining existing literature reveals a wealth of research dedicated to the human (HR) resources ecosystem, providing valuable insights into its various dimensions and applications. However, a notable gap exists in the precise elucidation of the ecosystem's structure concerning the specific groups of stakeholders under investigation. Many studies have overlooked the involvement of diverse layers within the system, resulting in a theoretical vacuum regarding

the clarity and inclusivity of the designed ecosystem. To address this gap, our research endeavors to conduct a meticulous and in-depth analysis, delving into the nuanced perspectives of different stakeholders. By doing so, it aims to uncover hidden opinions and perspectives across various layers of the HR ecosystem. Through this comprehensive exploration, our research seeks to make informed decisions about the requisite assumptions for designing a legitimate and inclusive HR ecosystem, thereby contributing to enhancing and refining existing .theoretical frameworks in this field

3. Methodology

In line with the central research question focusing on the assumptions in the design of the human resources ecosystem in Iran, this section delineates the research methodology, data collection method, and other pertinent details. Two distinct approaches are adopted for comprehensive data collection and analysis. The primary approach employs the Total Systems Intervention (TSI) methodology. Simultaneously, a complementary method is employed to grade and identify the significance of various indicators. This secondary approach leverages the Importance-Performance Approach (IPA), as [Bi et al. \(2019\)](#) outlined. The forthcoming sections will expound upon the specifics of the research design, interview seven experts (from a statistical population of all HR experts and managers in Tehran), and obtain data gathering procedures, providing a comprehensive overview of the methodological framework guiding this study.

3.1. Total systems intervention (TSI)

The purpose of TSI is to implement the requirements of critical systems ([Tayebnia et al., 2023](#)). In short, it sees the conditions of the issues as full of disturbances that cannot be understood and analyzed based on only one point of view; that is why it believes that they should be looked at from different points of view. Perhaps, like what is summarized in the metaphors, when the facilitators and the participants have agreed on the topics and issues of progress, it is time to choose a methodology or a set of systematic methodologies to manage the disorder and face the issues ([Zare Mehrjerdi and Bakhshandeh, 2023](#)). This choice should be made with the knowledge of the strengths and weaknesses of the methodologies at hand, which are revealed by critical systems. It is important to consider pluralism when choosing a methodology. Different methodologies can be used to examine different aspects of the problem and ensure that all interests are considered technically critical and emancipatory. In addition,

the initial choice of methodology should be subject to continuous review and may change as the nature of the disorder changes. This way, TSI leads to an intervention continuously examining and addressing the main issues. According to the explanations, it is clear that because TSI uses all system methodologies, it should be described as a meta-methodology. The following six principles form the basis of this meta-methodology (Dehghan Nayeri et al., 2020):

- (1) The conditions of the issues are too complex to be understood from one point of view, and the consequences they create are too complex to be dealt with by immediate solutions;
- (2) Therefore, the situation of issues and concerns, the consequences and problems they contain must be evaluated from different perspectives;
- (3) After the main issues and topics are identified, an appropriate choice of methodology(s) should be made to guide the interventions;
- (4) It is necessary to gain a complete understanding of the strengths and weaknesses of systematic methodologies and use this knowledge along with understanding the main issues and issues to choose appropriate methodologies;
- (5) Different systems perspectives and methodologies should be used to define and examine different aspects of organizations and their issues in a complementary way; TSI follows systematic cycles during its three phases.
- (6) Facilitators and participants are involved in all stages of the TSI process.

In this research, using the TSI approach, two methodologies have been selected and used for evaluation, the schematic of which can be seen in Figure 2:

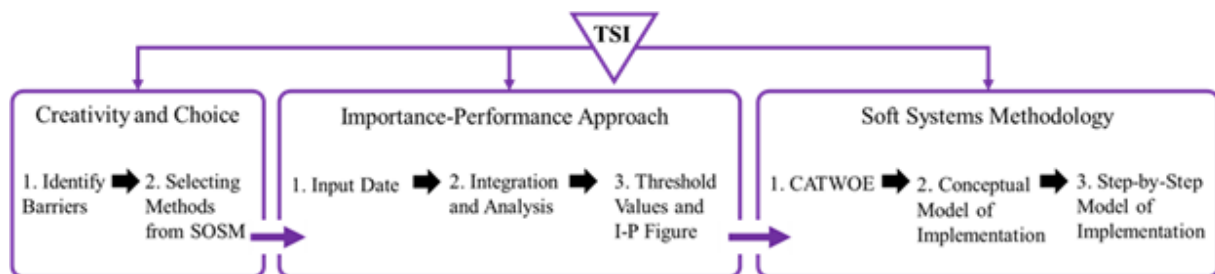


Figure 2. Schematic of the modelling stages and investigation of the problem under the TSI framework.

After presenting the method and methodology of the work, according to the steps of the action research method (Pashaa et al., 2023), it is time to use the idea and meta-methodology in the target organization, which is discussed below. As stated in the introduction, TSI has three main stages of creativity: selection of dominant methodologies and implementation. This section describes how to deal with each of these stages (Mirhosseini et al., 2021). After identifying the problems and barriers of ecosystem implementation in the previous phase, dominant methodologies should be selected to solve them in the second phase. At this stage, the appropriate methodologies to solve the issues raised have been selected based on the framework of ideas understanding the context of the issues in the SOSM (Checkland and Poulter, 2020).

The challenge lies in determining high-performance task subsystems amidst the complexity and pluralism of the ecosystem. The intricacy arises from numerous controllable and uncontrollable factors influencing the process of breaking down subsystems into an executable operational plan. The organizational culture further contributes to the complexity of the issue's conditions. Participants adopt a pluralistic mindset, acknowledging that multiple stakeholders may propose various solutions, each viewing the problem from a unique perspective. The ultimate goal is to reach a consensus among these diverse viewpoints. Therefore, according to the research conducted in the methodologies suitable for these conditions and according to the position of the problem in the SOSM table, the SSM methodology (Checkland and Poulter, 2020) has been chosen as the dominant methodology, but considering that one of the stages of TSI is to recognize the Barriers and root problems. This step deals with structuring the obtained options using the IPA approach (Bi et al., 2019).

These methodologies are right at the opposite point of complex methods, and this method focuses on recognizing the problematic situation. According to Checkland and Poulter (2020), the list of instructions for improvement is worthless, and only practice and learning are valuable and lasting (Checkland & Poulter, 2020; Faezirad & Khoshnevisan, 2023). This methodology adopts an action research approach to address problems, emphasizing a knowledge-based foundation for generating solutions and improving conditions. Following Checkland's seven-stage model for SSM, the process begins with an unstructured problem situation (Step 1) and progresses to a structured state through analysis and creating a rich picture (Step 2). The third step involves using CATWOE elements (Customer, Actor, Transform, World view, Owner, Environment) to formulate root definitions for the system. Subsequently, a model of targeted activities or a conceptual model is developed in Step 4. Step 5 entails comparing the existing situation with the conceptual model, identifying improvement measures and potential changes in Step 6.

For the implementation of TSI, its modified version was used, which, according to what Jackson (2020) says, the three phases of creativity, selection, and implementation should be repeated in this phase. Therefore, meetings were held with the relevant human resources ecosystem planning group for the creativity stage to update the ecosystem indicators (Dehghan Nayeri et al., 2020). The organization's challenges in progressing toward ecosystem implementation were documented during brainstorming sessions. Key issues included identifying necessary steps and formulating an operational plan to ensure successful implementation. Analysis of discussions and diverse proposals posed a challenge, necessitating

a consensus among group members. To address this, researchers recommended employing methods from the pluralism approach. Given the group's familiarity with IPA and SSM, these methodologies were chosen to navigate and resolve challenges during the implementation phase in the organization.

3.2. IPA technique

The performance-importance analysis (Bi et al., 2019) is a multi-indicator model (Taghipour et al., 2023 b). The effectiveness of this model strongly depends on its analytical indicators. In the IPA model, each index is evaluated from the perspective of two dimensions: "importance (ideal situation)" and "performance (current situation of factors)". This model uses essential criteria to determine where resource allocation is most critical. A performance-importance analysis matrix structures the IPA technique. This matrix consists of two axes, the X-axis showing the performance and the Y-axis of its importance.

This matrix is shown in Figure 3, which is divided into four quadrants, and each quadrant has a specific strategy that helps the decision-making process. This matrix determines the degree of priority of indicators for improvement (Bi et al., 2019).

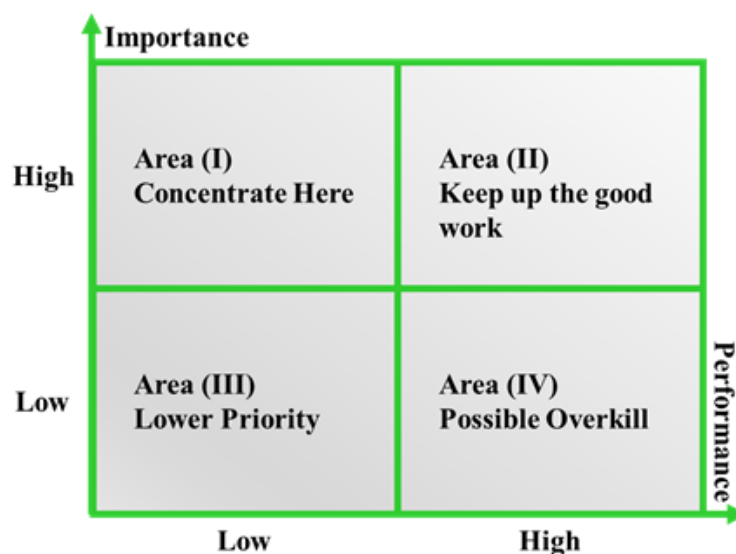


Figure 3. Performance-importance analysis matrix and quadratic model (Bi et al., 2019).

Importance shows the relative value of indicators in quality. Since the separate analysis of the performance dimensions and importance dimension data, especially when both sets of data are studied simultaneously, may not be meaningful. Therefore, the data related to the importance level and the performance of indicators on the 2D network are displayed in the above figure. This two-dimensional network is called the importance/performance matrix or IP matrix. The role of the matrix, which consists of four parts or quadrants, and there is a specific

strategy in each quadrant, is to help the decision-making process. In the IPA model, indicators can be measured on a scale of 5, 7, or 9 degrees, and data related to their importance and performance level is collected using a questionnaire. For this purpose, customers are asked two questions about each index, the importance of the desired index, and the level of performance in that index.

First Area: In this area, the process importance of the process is very high, but the process performance is weak, so the processes in this sector are vulnerable and should be prioritized for improvement. Perceived characteristics are important for people, but the organization's performance level in those characteristics is low. This quadrant shows the weakness of the organization or company. The basic point is that the inability to identify the characteristics in this quadrant causes low customer satisfaction. Efforts to improve should be given the highest priority because the main weakness is in this area (Bi et al., 2019).

Second Area: This quadrant is considered to be the main strength of the organization, which should be continued. The importance of the process is very high, and the performance of the process is strong, so the processes of this sector are maintained and given more attention as competitive advantages.

Third Area: In this quadrant, the specified factors are unimportant. The organization is also weak in those criteria. On the other hand, since they are not very important, the company should not focus too much on this sector and waste its resources. Only limited resources should be used (Ramezani et al., 2021).

Fourth Area: In this quarter, the criteria are of low importance, but the company's performance in this sector is high. In this section, resources are wasted. In other words, the resources allocated to these features are more than necessary and should be spent elsewhere. This model is known as the quadratic model. It is an area where the importance of the process is low. However, the performance of the process is very strong, so the processes of this department cause waste in the organization and should be eliminated or properly exploited. The steps of IPA are as follows: First step: First, effective indicators should be extracted based on the goal of the problem. Second step: Determine the importance of the influencing factors. b_{jp} and c_{jp} represent the importance and performance values, respectively, which are determined for the j th attribute by the p th decision maker or customer. A Likert scale can characterize these values. In this method, a 5-point Likert scale is used. Step 3: Use the geometric mean and integrate the opinions of all decision-makers or customers. Saati suggests that using the geometric mean is a more effective way to express the collective opinion of several decision-makers. Thus, b_j is the

final importance value, and c_j is the final performance value of the j th characteristic, which results from the collective opinion of p customers or experts. In order to study more closely, the steps of this method in the research [Bi et al. \(2019\)](#) can be examined.

3.3. *Soft systems methodology (SSM)*

SSM soft systems methodology was proposed for the first time in 1972 by Checkland at Lancaster University, and the first article about SSM titled (Towards a System-Oriented Methodology for Solving Real World Problems) was published in Systems Engineering Journal by Peter Checkland in 1972. Print the receipt. SSM is an action research method that creates learning through research into problem conditions ([Checkland and Poulter, 2020](#)). In other words, since this method is an action research method, it not only causes intervention in problematic situations but also causes learning from this intervention by creating feedback loops; the methods used to implement SSM are extensive. However, the conceptual basis used is permanently fixed. In SSM, targeted conceptual models, each of which can be interpreted in several ways, are a means that provides a structure and framework through which discussions between people are guided and an agreement is reached between people with different and sometimes conflicting views ([Cabrera et al., 2023](#); [Wieland et al., 2023](#)). The most famous and common research method in soft operations is the soft systems methodology (SSM), an action research method that creates learning through research in problem conditions. This methodology uses a seven-step process, according to Figure 4.

In the first stage, the problem in the real world is discovered, and its location is considered; in this stage, it has been specified what exactly is looked for, and the general space of the problem is drawn ([Checkland and Poulter, 2020](#)). In the second step, the situation of the problem, the people involved, and the structure of the problem are drawn in the form of illustrative images. These are simple images of those things that people feel are the most important aspects of the situation under investigation. These images show the problems related to the situation with the rapid modeling of the systems and help to provide a tool for initial recognition by comparing the model with real actions. The third step: In this step, the real world enters the conceptual and systemic world, and the fundamental definition of the problem is presented.

Fundamental definition: It is a sentence that describes the ideal system, its goals, the people involved in the situation, the people affected, and the influencer. A basic definition is derived from the first and second steps using a CATWOE technique. Therefore, it is possible to create

a set of fundamental definitions, which group discussions will help to reach an agreement on a fundamental definition (Checkland and Poulter, 2020).

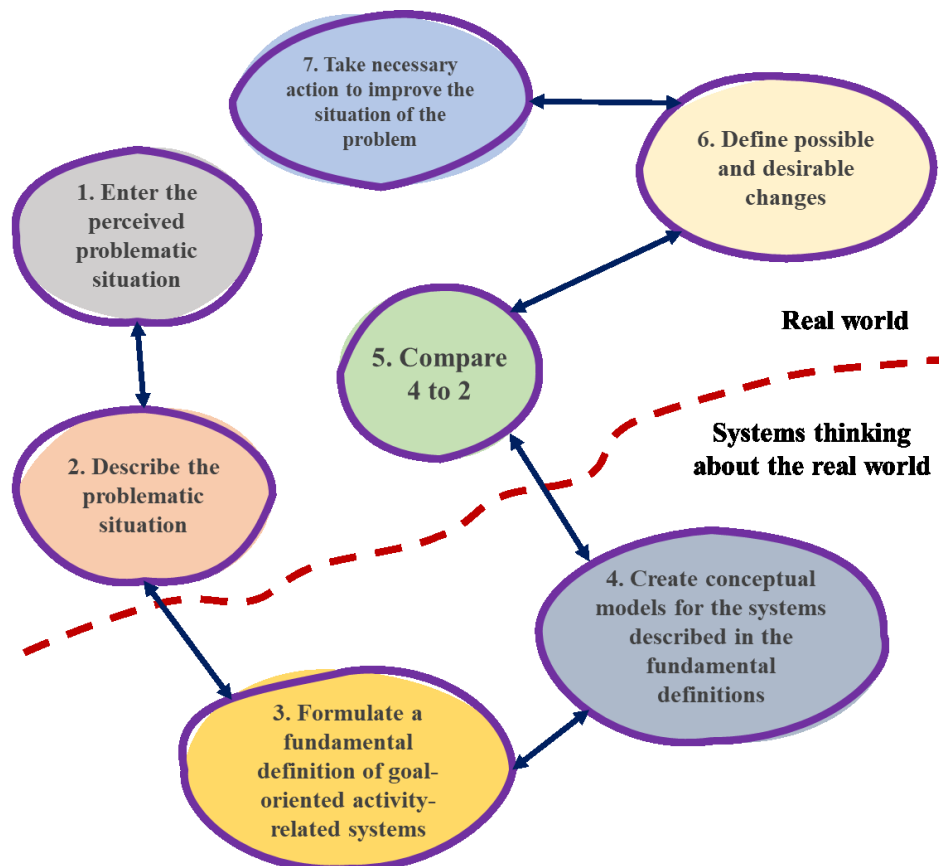


Figure 4. Seven main stages of soft systems methodology.

Fourth stage: Creating a conceptual model: A conceptual model, which represents activities with relevant relationships, is created using the basic definition. The model process consists of the following:

Using imperative verbs, express the necessary activities that must be performed

- (1) Choose activities that can be performed alone
- (2) Put these activities in one row and put other activities that are related to these activities in the next rows.
- (3) Show the dependence between activities using vectors
- (4) Move the arrangement of activities to avoid overlapping vectors as much as possible.
- (5) Finally, check if your model has system features.

System features: 1- A goal in progress 2- A means to evaluate performance 3- Decision making process 4- System components 5- Components that have mutual effect 6- Environment 7- Boundary between systems and environment 8- Resources 9- Continuity. The model should have five to nine activities that are related to each other based on logical dependencies.

Fifth stage: Comparing the conceptual model with the real world: This step compares steps 2 and 4. In this step, the model built in the previous step is compared with what is in the world

and shown in step 2. This work changes the conceptual model to the real world. The result of this step may lead to repeating steps 3 and 4. Sixth stage: Determining possible and desirable changes: In this step, whether the methods proposed in the previous steps will improve the system is determined. In other words, possible and desirable changes are identified in the sixth stage. After discussion and exchange of opinions between analysts and people involved in the issue of changes, they are approved. Structural, procedural, and behavioral changes show all kinds of changes in this stage. Seventh stage: Improving the situation of the problem: In this step, it is determined how the changes of the previous step will be implemented. In the seventh stage, the changes mentioned in the sixth stage are implemented, and a new iteration can be started. Based on what was discussed in the methodology section, the research steps were generally described, and it was determined what methods were used for analysis. Based on this, the various steps claimed will be implemented in the next part.

4. Implementation and results

4.1. The first stage: creativity

Based on TSI steps in the first phase, creativity is needed to understand issues and concerns related to the human resources ecosystem, with the help of tools such as social paradigms and organizational metaphors (Mingers & Rosenhead, 2004; Sydelko et al., 2024). At this stage, in the beginning, the Barriers to the implementation of the human resources ecosystem have been identified, and then, according to the literature review and studies conducted by the researchers in the case of science and technology parks in Iran, some of the Barriers to the implementation of the human resources ecosystem, which are: the lack of appropriate culture for the implementation Ecosystem, procedural order and lack of executive flexibility, Barriers related to the formation of subsystems and specific functional units, structural and cultural Barriers to the implementation of new procedures, environmental uncertainty, and organizational dynamics, external policies and laws. Accepted, the weak participation of the stakeholders in establishing the ecosystem, the lack of connection between the goals of the ecosystem and the organizational resources, and the lack of skills of managers in using management tools for the optimal allocation of resources were introduced as important concerns. In the end, among them, two main challenges are "the lack of clear strategies for the implementation of the human resources ecosystem and the lack of satisfaction and cooperation of the employees for its proper implementation" and "the lack of trust of the executive managers in the results obtained from the implementation of the human resources ecosystem and not having the necessary expertise

in the field Allocation of resources and the absence of a clear connection between the resources of the organization and the needs of the ecosystem, which is a kind of environment over other factors and of course can be solved by the researchers, were chosen. According to them, the dominant issues identified are:

- (1) How to form specific sub-systems and functional units so that they have an executive guarantee and involve the participation of the organization's employees.
- (2) Simulating the results of implementing the human resources ecosystem and its prioritization, as well as how to allocate resources for its implementation optimally.

According to the review of the literature and the prevailing conditions of public organizations, including in the organization in question, if the procedures related to the designed ecosystem are derived from the opinions of their executives in the organizations and their compilation is done from the bottom up, it can be optimally Attract the participation of these people for the implementation of the ecosystem and in this way give a suitable answer to the first problem. Also, one way to gain managers' trust is to use methods to predict the future. The results of the forecast should be a source for managers to make decisions, so their process should be undeniable and logical in the eyes of the relevant managers so that it can make them believe in the implementation of the ecosystem in the future so that the second problem can also be answered appropriately.

4.2. The second stage: selection

In the continuation of the process of choosing the dominant methodology, because the initial agreements have been made in the selection of ecosystem indicators for their prioritization and the allocation of resources, this study faced a unifying and still complex problem, which, according to the positions of that problem in the SOSM table, from the IPA and SSM methodologies It has been taken as one of the most used methods in the field of policy making and decision making, which will be after TSI steps.

4.3. The third stage: implementation of TSI

First, the IPA method was implemented, and its contents were presented. Here, the IPA method is customized according to the nature of the problem. In this matter, importance, and performance are the main criteria; in this context, performance is a word with a positive meaning. Therefore, the performance of barriers has been considered negative (the greatest amount of destruction/inhibition for implementing the human resources ecosystem). In the following, the input Table 2 is presented, which was obtained from the point of view of seven

experts in the field of human resources. These seven experts have at least 5 years of experience in human resources and are working in the headquarters and regional units of the mentioned government organization.

Table 2. Barriers and input data of 7 experts

Code	Barriers	I1	I2	I3	I4	I5	I6	I7	P1	P2	P3	P4	P5	P6	P7
A1	Absence of proper culture for the implementation of the ecosystem	5	1	5	3	2	2	2	5	3	1	4	2	5	5
A2	Prescriptive procedures and lack of executive flexibility	3	2	5	4	5	2	2	2	2	2	4	2	2	5
A3	Barriers related to the formation of specific sub-systems and functional units	3	3	3	4	1	4	1	1	4	2	3	1	5	2
A4	Structural and cultural barriers to the implementation of new procedures	5	1	1	2	4	4	1	4	4	2	4	3	3	2
A5	environmental uncertainty and organizational dynamics,	3	5	4	4	3	1	4	1	2	1	4	4	1	4
A6	Foreign policies and approved laws	1	3	1	4	4	1	4	1	2	3	2	4	1	4
A7	Little participation of stakeholders in establishing the ecosystem	1	5	4	4	1	5	4	2	4	5	4	2	2	4
A8	Ecosystem objectives are not related to organizational resources	4	3	3	3	3	1	4	1	1	5	4	2	4	1
A9	Lack of managers' skills in using management tools to allocate optimal resources	1	1	5	1	3	1	3	1	2	4	1	3	3	3

After collecting the experts' data using a 5-point Likert scale, these data are aggregated by geometric mean and converted into a single value for each obstacle. A threshold value is also considered for both criteria. The examination of Barriers and the average obtained are specified in Table 3.

Table 3. The result of the analysis of the IPA method and the obtained threshold limit.

Barriers	P(Avg)	I(Avg)
A1	3.1386	2.4939
A2	2.5170	3.0401
A3	2.1879	2.3796
A4	3.0224	2.0648
A5	2.0000	3.1203
A6	2.1193	2.1193
A7	3.0683	2.8690
A8	2.0648	2.7839
A9	2.1552	1.7226
Threshold Value	2.4748	2.5104

Based on the obtained threshold, whose lines are red, it can be seen that Barriers 5 and 8 have the highest level of deterrence and importance. Also, barriers 2 and 7, despite their high importance, have a low deterrence rate is low. Likewise, the criteria below the red horizontal line are less critical.

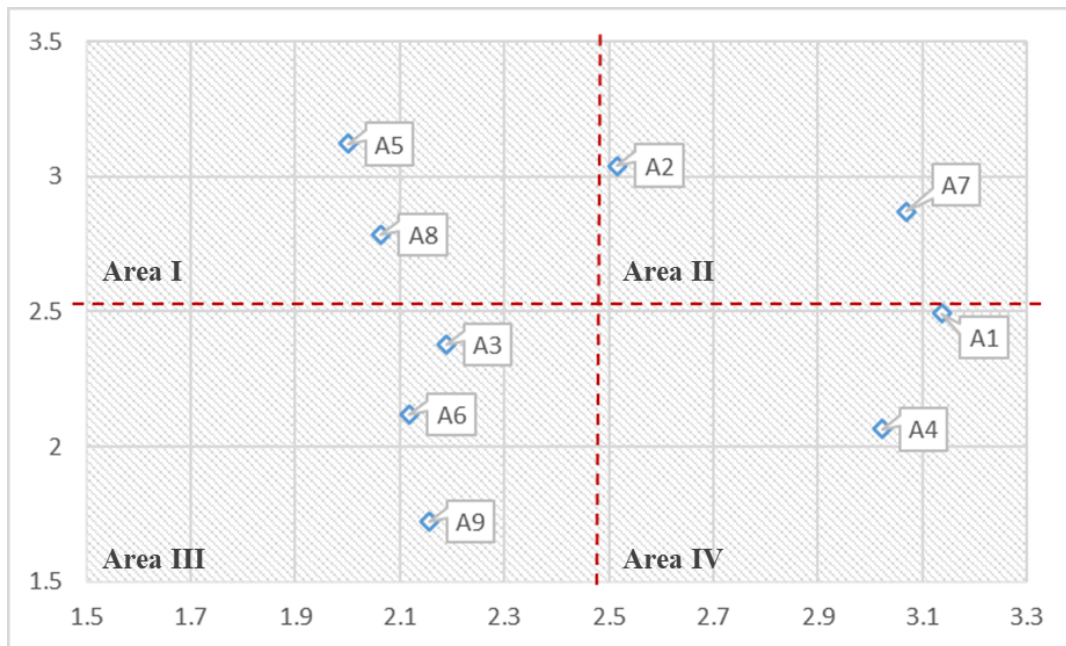


Figure 5. Location of barriers in performance-importance chart

Based on Figure 5, it is clear that more focus should be placed on the issue of aligning goals and planning, stakeholder participation, robust planning to face uncertainty, and executive flexibility. In the same way, according to the opinion of the experts, it became clear that in order to remove these barriers and solutions by the SSM method and with a precise definition of the system and its main actors, a solution should be found for the implementation of the human resources ecosystem.

For this purpose, following steps one and two of the SSM method during the formation of the meetings, in the third step, the definition of the roots with the help of CATWOE elements in Table 4 and according to the principles presented by [Mingers and Rosenhead \(2004\)](#), for the ecosystem executive system in the organization was explained as follows: "A system owned by the primary stakeholders of the company, and jointly managed with the human resources department and other department representatives, has effectively translated strategic human resource plans into actionable steps to achieve our planning objectives. However, this system is currently constrained by financial, time-related, cultural, and structural limitations."

Table 4. CATWOE elements

C	Customers	The head of the organization / main owners and shareholders / employees of the organization's departments
A	Actors	Strategic planning department / elected representatives from other departments
T	Transformation	Transforming strategies into operational measures with high performance guarantee
W	World view	A system that leads to access to strategic goals in the organization
O	Owner	Head of the organization
E	Environmental constraints	Lack of proper culture and structure for implementation, time and financial limitation

After explaining the root definitions, the conceptual model of the activity was extracted based on it in step 4. According to group discussions in numerous meetings and research conducted in similar organizations, such as existing models in the human resource ecosystems of different countries and companies, especially in public organizations, a conceptual model related to the next stage was drawn.

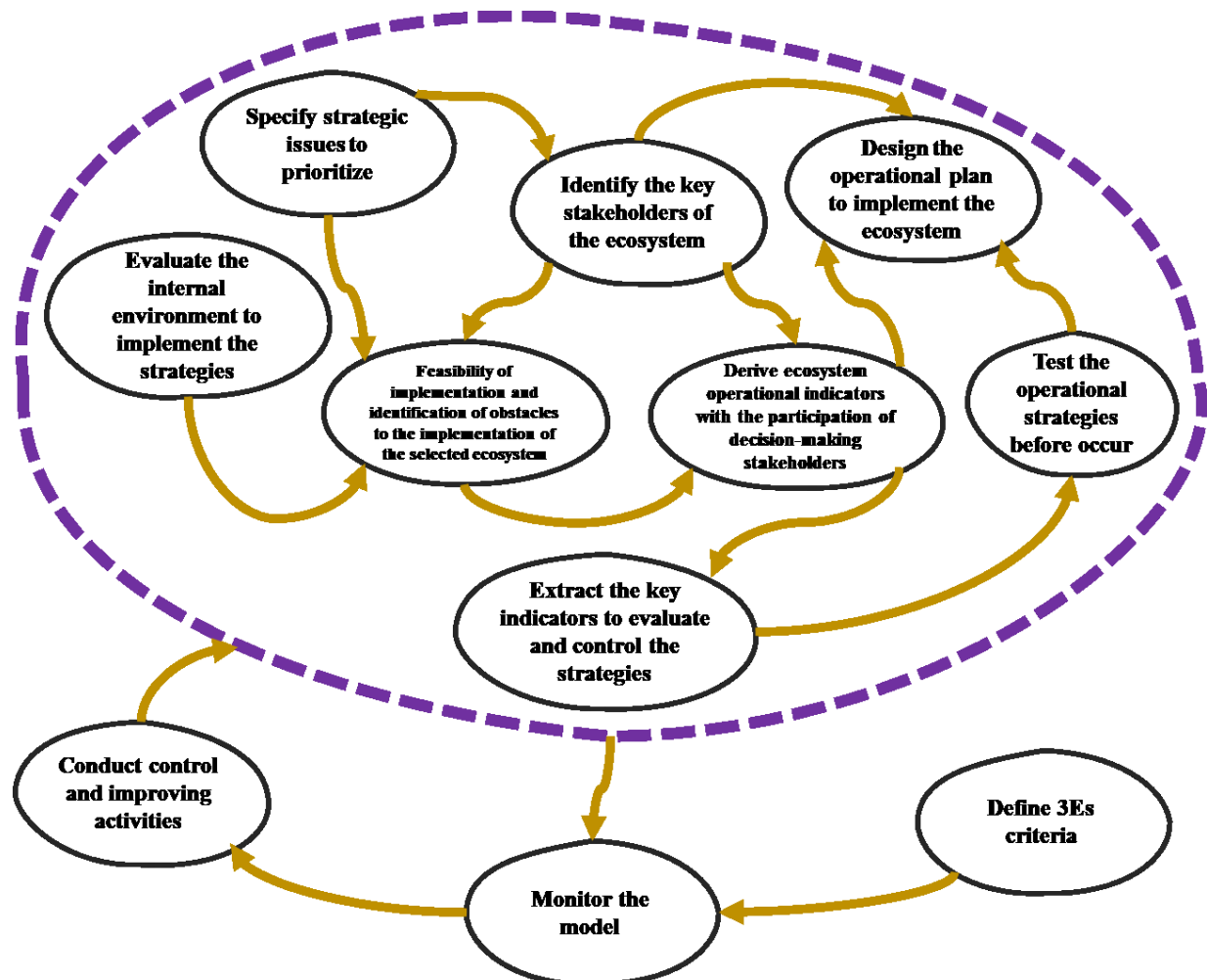


Figure 6. The conceptual model of the human resources ecosystem implementation system in a public organization

As can be seen in the conceptual model, in order to measure the validity of the model according to the three criteria (3E) of adequacy, efficiency, and effectiveness⁹, appropriate measures have been defined, and these three criteria are, respectively:

- A. Adequacy: Does the conversion process work properly?
- B. Efficiency: Is the conversion process done with minimal resources?
- C. Effectiveness: Does the conversion process lead us to the main goals?

All three defined criteria were examined during group meetings. In this way, the adequacy of the model was obtained by attracting the opinion of experts so that each person admitted that

the model and the activities defined in it are sufficient to implement the human resources ecosystem and, further, about the efficiency standard through comparison, which was carried out with the previous process to implement human resources management in the organization in question. Its efficiency was confirmed, and finally, the subject owners confirmed the model's effectiveness, considering that the extracted activities were based on the goal of implementing the human resources ecosystem.

In the fifth stage, the comparison of the conceptual model with what is happening in practice in the target organization was discussed, and improvement proposals were presented in the form of necessary steps to implement strategies in organizations similar to the target organization, as has been seen in Figure 7. and thus, the sixth stage was implemented.

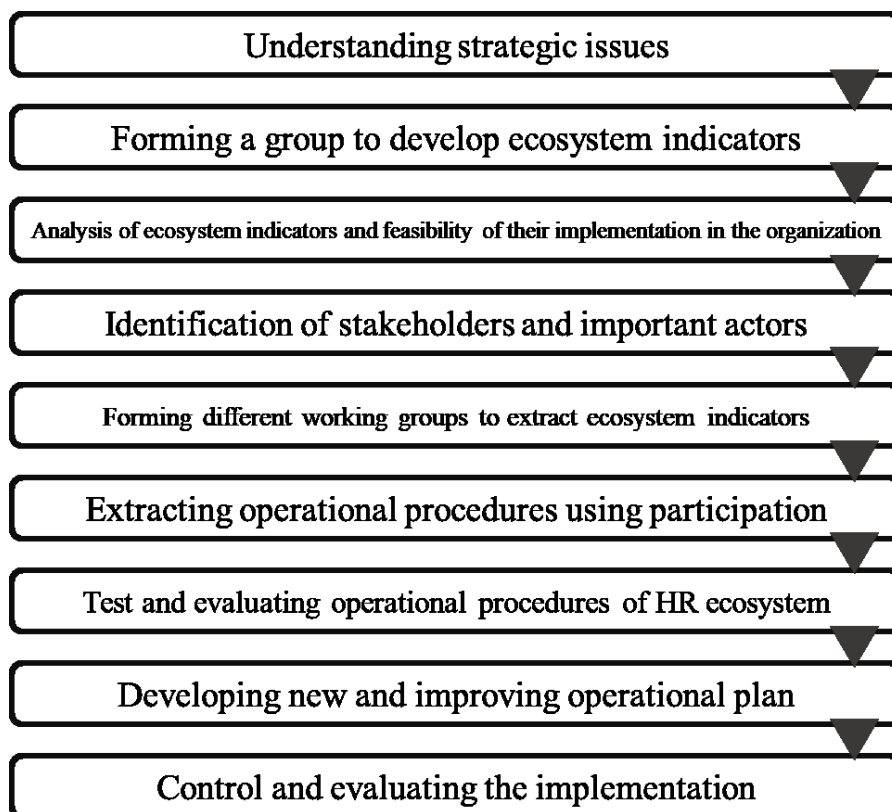


Figure 7. The steps of implementing the human resources ecosystem in a public organization.

The steps in Figure 7 were extracted to implement the strategy in a government organization using an action research method. They were implemented in practice, so the seventh stage of SSM was also completed. Thus, TSI meta-methodology was used in the organization in question, and the themes were used. The research led to developing a roadmap for implementing the human resources ecosystem in similar organizations, which is introduced in the next section.

Before stating the benefits of implementing the ecosystem in this section, the necessary guidelines are given as fully operational recommendations to the human resource planning group for implementing selected ecosystem indicators (which in public organizations are usually determined by those in power or the government). For the proposed model, due to the benefit of systemic methodologies, several advantages can be mentioned, among the most important of which are combined methods of extracting and evaluating human resources ecosystem indicators and also reducing the distance between the planning and operational layers by attracting the participation of stakeholders and executives. The strategy is to prepare the operational plan for the human resources ecosystem. Below are the advantages and other points of the presented model:

- Ease of implementation steps and high adaptability to special conditions in each organization.
- The pragmatic and action-oriented aspect of the model makes it attractive to implement.
- Learning strategy and paying attention to culture are the basic principles for implementing strategies.
- Reducing the risk and costs of strategy implementation by simulating them in a virtual environment.
- Having the flexibility to face environmental changes and uncertainties in the organization.
- Preventing the interference of individual emotions in the formulation of strategies due to the commitment to the results of group work.
- Economic efficiency of the model for implementation due to the use of the power of people within the organization.

Of course, in the beginning, it may take much time to implement. However, in the future, every time the roadmap is used, the learning will lead to its completion, increasing the strategic knowledge of people and reducing costs, and things like this, all of which are somehow the result of using the methodology. - It is a system in the human resources ecosystem that has been approved by the people in the organization's human resources department.

5. Discussions and managerial insights

The human resources ecosystem can positively contribute to the innovative activities of the organization. The human resources ecosystem also positively affects employee engagement, leadership, managers' motivation to learn, promotion of learning culture, and development of social capital (Sheehan et al., 2014). Emerging technologies, in particular, play a key role in helping to find innovative ways to help people of all ages develop knowledge and skills (Molvey, 2021). During this research and in the stages of implementation of IPA and especially SSM methodologies, in the framework of TSI, information about the benefits and importance

of the human resources ecosystem and its implementation in the studied organization and in general in Iran was obtained. Also, with field surveys, it is possible to provide the context for implementing such systems in organizations and be a starting point for organizations to move their view from the traditional approach to human resource management to newer paradigms such as the human resource ecosystem. This issue becomes doubly important because municipalities are one of the custodians of the growth and development of the urban economy. According to the mentioned materials, it can be said that what will happen if the focus is on the ecosystem of human resources:

- (1) Recognizing and consciously focusing on the strengths and areas of human resources that can be improved, which leads to the compilation of accurate and local resources in this area.
- (2) By focusing on this ecosystem, human resources planning can be improved in different horizons (short-term, medium-term, and long-term).
- (3) By paying more attention to the ecosystem, it is possible to help improve or redesign human resources' structure, processes, activities, and systems.
- (4) Using different criteria leads to an increase in the share of human resources in realizing business goals and strategies.
- (5) Using different performance indicators better describes human resources' contribution to organizational performance.
- (6) Detailed investigation and analysis of the human resources ecosystem will increase the effectiveness of this ecosystem and its seven subsystems.
- (7) Addressing the fundamentals of the human resources ecosystem will strengthen the efficiency of the seven parts of the ecosystem, leading to a better interaction of the subsystems.
- (8) One of the emphases of the human resources ecosystem is to create a learning environment for employees. Creating such an environment in the ecosystem is necessary to promote learning from experiences in the entire ecosystem.
- (9) Considering that this issue of the human resources ecosystem has been raised as one of the new trends in human resources management, its investigation in Persian sources is essential, which will lead to improving the scientific level in this field.

6. Conclusion

Iran's industries, which, despite technological growth, still have a high dependence on human power, and in other words, with the introduction of technology and machinery into the field of activity of these industries, contrary to expectations and contrary to what is seen in the world, human power still has the main say. Even though technology is a substitute for human power in many industries, production lines hire less but more expert human power due to technological development. Unfortunately, this issue has not happened in Iran's industries, and this study shows a reverse procedure in this rule. Considering that there are major challenges in the country's human resources field today, this problem has doubled the problems of Iranian industries. Moreover, this issue has created severe challenges for Iran's industries since today's

generation is looking for mechanized and more leisurely activities and is interested in something other than hard work. Also, with the investigations carried out in the empirical literature, it has been established that the concept of the human resource ecosystem is a new and innovative topic that has been neglected by researchers in domestic research and has received less attention in foreign research. By conducting more extensive research in this field, it is possible to help develop the theoretical foundations and concepts of the human resources ecosystem and the development of industries.

Therefore, this research aimed to design and implement a framework for analyzing the barriers to creating a human resources ecosystem, relying on deep systemic views and critical thinking. This research's main question was, what barriers slow down or fail to implement this ecosystem in public sector organizations in Iran? The second question that challenged us in this field was how, knowing these barriers, have barriers solved and overcome them. Therefore, in order to solve this problem, a series of approaches were chosen. At the beginning of facing the problem, the system was discussed with comprehensive systems interventions. Then, using the TSI framework, the main barriers to implementing the human resources ecosystem were identified, and barriers in terms of their importance and effectiveness should have been understood. By examining the framework of TSI and the tools it provided, the IPA approach was chosen for this purpose. This approach, based on the opinions of 7 experts, examined the barriers. Then, it identifies the most important barriers that impact the system (negative performance) most. After this stage, the experts' views were focused on stakeholders, flexibility, environmental uncertainties, and, most importantly, the non-compliance of strategic plans. At this point, the issue is investigated and recognized using the soft systems technique, workable solutions are organized to be implemented, and the obstacles to the human resources ecosystem are eliminated. Ultimately, the procedure for its implementation was determined step by step.

The present study opens avenues for future research in several critical areas within human resource ecosystem management. Firstly, there is a promising avenue for research to delve into identifying and exploring human resource ecosystem enablers and understanding the factors that facilitate the successful implementation and functioning of such ecosystems within organizational contexts. Additionally, the emergence of Human Resource 4.0 presents an intriguing area for investigation, exploring the integration of advanced technologies, artificial intelligence, and data analytics in shaping the future landscape of human resource management. Future research can benefit from employing a mixed-methods approach, combining hard and soft operations research techniques to understand the intricate dynamics within the human

resource ecosystem comprehensively. Moreover, employing innovative Multiple Attribute Decision Making (MADM) methods such as COCOSO (Comprehensive Compromise Solution) and WASPAS (Weighted Aggregated Sum Product Assessment) can offer a quantitative framework to assess and quantify the outcomes of this research, providing a more nuanced understanding of the complex interplay of factors involved in effective human resource ecosystem management.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

- Alfes, K., Veld, M. and Fürstenberg, N., 2021. The relationship between perceived high-performance work systems, combinations of human resource well-being and human resource performance attributions and engagement. *Human Resource Management Journal*, 31(3), pp.729-752. <https://doi.org/10.1111/1748-8583.12310>.
- Amelia, P., 2018. Digital HR: A Critical Management Approach to the Digitalization of Organizations. *SSRU Journal of Management Science*, 5(2).
- Ang, J.B., Madsen, J.B. and Islam, M.R., 2011. The effects of human capital composition on technological convergence. *Journal of Macroeconomics*, 33(3), pp.465-476. <https://doi.org/10.1016/j.jmacro.2011.03.001>.
- Asadi, H., Barati, O., Garavand, A., Joyani, Y., Kahkesh, M.B., Afsarimanesh, N., Seifi, M. and Shokri, A., 2022. Challenges facing hospital human resources during the COVID-19 pandemic: a qualitative study in Iran. *International Journal of Human Rights in Healthcare*, 15(5), pp.489-498. <https://doi.org/10.1108/IJHRH-03-2022-0016>.
- Bi, J.W., Liu, Y., Fan, Z.P. and Zhang, J., 2019. Wisdom of crowds: Conducting importance-performance analysis (IPA) through online reviews. *Tourism Management*, 70, pp.460-478. <https://doi.org/10.1016/j.tourman.2018.09.010>.
- Burke, C.M. and Morley, M.J., 2023. Toward a non-organizational theory of human resource management? A complex adaptive systems perspective on the human resource management ecosystem in (con) temporary organizing. *Human Resource Management*, 62(1), pp.31-53. <https://doi.org/10.1002/hrm.22132>.
- Cabrera, D., Cabrera, L.L. and Midgley, G., 2023. The four waves of systems thinking. *Journal of Systems Thinking*, pp.1-51. <https://doi.org/10.54120/jost.000051>.
- Checkland, P. and Poulter, J., 2020. Soft systems methodology. *Systems approaches to making change: A practical guide*, pp.201-253. https://doi.org/10.1007/978-1-4471-7472-1_5.
- De Stefano, F., Bagdadli, S. and Camuffo, A., 2018. The HR role in corporate social responsibility and sustainability: A boundary-shifting literature review. *Human Resource Management*, 57(2), pp.549-566. <https://doi.org/10.1002/hrm.21870>.

- Dehghan Nayeri, M., Khazaei, M. and Alinasab-Imani, F., 2020. The critical heuristics of Iranian banking credit system: analysis of the antithetical opinions of the beneficiaries. *Systemic Practice and Action Research*, 33, pp.363-392. <https://doi.org/10.1007/s11213-020-09524-x>.
- Dharmasiri, A.S., 2015. Exploring an HR Ecosystem: A Glimpse through Ten Gs. <http://repository.kln.ac.lk/handle/123456789/16119>.
- Donnelly, R. and Hughes, E., 2023. The HR ecosystem framework: Examining strategic HRM tensions in knowledge-intensive organizations with boundary-crossing professionals. *Human Resource Management*, 62(1), pp.79-95. <https://doi.org/10.1002/hrm.22115>.
- Ehsanifar, M., Dekamini, F., Spulbar, C., Birau, R., Khazaei, M. and Bărbăcioru, I.C., 2023. A Sustainable Pattern of Waste Management and Energy Efficiency in Smart Homes Using the Internet of Things (IoT). *Sustainability*, 15(6), p.5081. <https://doi.org/10.3390/su15065081>.
- Faezirad, M. and Khoshnevisan, A., 2023. Leveraging the Potential of Soft Systems Methodology to Trigger Data Governance Policy-Making in the Banking Industry. *Journal of Systems Thinking in Practice*, 2(1), pp.56-70. 0.22067/jstinp.2023.81196.1038.
- Fraumeni, B.M. and Liu, G., 2021. Summary of World Economic Forum, "The Global Human Capital Report 2017—Preparing people for the future of work". In *Measuring Human Capital* (pp. 125-138). Academic Press. <https://doi.org/10.1016/B978-0-12-819057-9.00008-1>.
- Fuller, J., Jacobides, M.G. and Reeves, M., 2019. The myths and realities of business ecosystems. *MIT Sloan Management Review*, 60(3), pp.1-9.
- Garavan, T.N., McCarthy, A. and Carbery, R., 2019. An ecosystems perspective on international human resource development: A meta-synthesis of the literature. *Human Resource Development Review*, 18(2), pp.248-288. <https://doi/abs/10.1177/1534484319828865>.
- Hu, B., McCune Stein, A., Mao, Y. and Yan, A., 2022. The influence of human resource management systems on employee job crafting: An integrated content and process approach. *Human Resource Management Journal*, 32(1), pp.117-132. <https://doi.org/10.1111/1748-8583.12392>.
- Jackson, M.C., 2020. Critical systems practice 1: Explore—Starting a multimethodological intervention. *Systems Research and Behavioral Science*, 37(5), pp.839-858. <https://doi.org/10.1002/sres.2746>.
- Khazaei, M., Hajiaghaei-Keshteli, M., Rajabzadeh Ghatari, A., Ramezani, M., Fooladvand, A. and Azar, A., 2023. A multi-criteria supplier evaluation and selection model without reducing the level of optimality. *Soft Computing*, 27(22), pp.17175-17188. <https://doi.org/10.1007/s00500-023-08954-8>.
- Khoshmaram, M., Shiri, N., Shinnar, R.S. and Savari, M., 2020. Environmental support and entrepreneurial behavior among Iranian farmers: The mediating roles of social and human capital. *Journal of Small Business Management*, 58(5), pp.1064-1088. <https://doi.org/10.1111/jsbm.12501>.
- Lim, D.H., Hur, H., Ho, Y., Yoo, S. and Yoon, S.W., 2020. Workforce resilience: Integrative review for human resource development. *Performance improvement quarterly*, 33(1), pp.77-101. <https://doi.org/10.1002/piq.21318>.
- Ma, R. and Zhang, J., 2020. Human Resource Ecosystem Health Assessment and Regulation of Marine Enterprises Based on Niche Measurement. *Journal of Coastal Research*, 115(SI), pp.317-321. <https://doi.org/10.2112/JCR-SI115-098.1>.

- Malik, A., Budhwar, P., Mohan, H. and NR, S., 2023. Employee experience—the missing link for engaging employees: Insights from an MNE's AI-based HR ecosystem. *Human Resource Management*, 62(1), pp.97-115. <https://doi/abs/10.1002/hrm.22133>.
- Martinez, E., 2016. The HR Ecosystem. *NHRD Network Journal*, 9(1), pp.45-48. <https://doi/pdf/10.1177/0974173920160112>.
- Mauro, T.G. and Borges-Andrade, J.E., 2020. Human resource system as innovation for organisations. *Innovation & Management Review*, 17(2), pp.197-214. <https://doi.org/10.1108/INMR-03-2019-0037>.
- Meijerink, J. and Keegan, A., 2019. Conceptualizing human resource management in the gig economy: Toward a platform ecosystem perspective. *Journal of managerial psychology*, 34(4), pp.214-232. <https://doi.org/10.1108/JMP-07-2018-0277>.
- Mingers, J. and Rosenhead, J., 2004. Problem structuring methods in action. *European journal of operational research*, 152(3), pp.530-554. [https://doi.org/10.1016/S0377-2217\(03\)00056-0](https://doi.org/10.1016/S0377-2217(03)00056-0).
- Mirhosseini, S.S., Ramezani, M., Khazaei, M. and Azar, A., 2021. Exploring and analysing the risks and challenges of implementing ERP systems: Critical system thinking. *International Journal of Information Systems and Change Management*, 12(3), pp.234-258. <https://doi.org/10.1504/IJISCM.2021.120325>.
- Nafari, E. and Rezaei, B., 2022. Relationship between human resources strategies and organizational performance based on the balanced scorecard in a public hospital in Iran: a cross-sectional study. *BMC Health Services Research*, 22(1), p.363. <https://doi.org/10.1186/s12913-022-07767-z>.
- Nayeri, M.D., Khazaei, M. and Abdollahbeigi, D., 2022. The drivers of success in new-service development: Rough set theory approach. *International Journal of Services and Operations Management*, 43(4), pp.421-439. <https://doi.org/10.1504/IJSOM.2022.127465>.
- Pashaa, N., Rabieh, M., Eslamifarc, G. and Hajiaghad, S.H.R., 2023. Analyzing the Manual and Automated Assembly Line Using System Dynamics (SD) Approach. *Journal of Systems Thinking in Practice*, 2(1), pp.1-27. <https://doi.org/10.22067/jstinp.2023.78113.1017>.
- Ramezani, M., Azar, A. and Khazaei, M., 2021, June. Gap analysis through a hybrid method: Critical systems heuristics and best worst method. In *The International Workshop on Best-Worst Method* (pp. 272-286). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-89795-6_19.
- Sawan, M., O'Donnell, L.K., Reeve, E., Gnjjidic, D., Chen, T.F., Kelly, P.J., Bell, J.S. and Hilmer, S.N., 2021. The utility of a computerised clinical decision support system intervention in home medicines review: a mixed-methods process evaluation. *Research in Social and Administrative Pharmacy*, 17(4), pp.715-722. <https://doi.org/10.1016/j.sapharm.2020.06.010>.
- Snell, S.A. and Morris, S.S., 2021. Time for realignment: The HR ecosystem. *Academy of Management Perspectives*, 35(2), pp.219-236. <https://doi.org/10.5465/amp.2018.0069>.
- Stone, R.J., Cox, A., Gavin, M. and Carpini, J., 2023. *Human resource management*. John Wiley & Sons.
- Sydelko, P., Espinosa, A. and Midgley, G., 2024. Designing interagency responses to wicked problems: A viable system model board game. *European Journal of Operational Research*, 312(2), pp.746-764. <https://doi.org/10.1016/j.ejor.2023.06.040>.

- Taghipour, A., Ramezani, M., Khazaei, M., Roohparvar, V. and Hassannayebi, E., 2023. Smart Transportation Behavior through the COVID-19 Pandemic: A Ride-Hailing System in Iran. *Sustainability*, 15(5), p.4178. <https://doi.org/10.3390/su15054178>.
- Taghipour, A., Sohrabi, A., Ghaedi, M. and Khazaei, M., 2023a. A robust vaccine supply chain model in pandemics: Case of Covid-19 in Iran. *Computers & Industrial Engineering*, 183, p.109465. <https://doi.org/10.1016/j.cie.2023.109465>.
- Taghipour, A., Fooladvand, A., Khazaei, M. and Ramezani, M., 2023b. Criteria Clustering and Supplier Segmentation Based on Sustainable Shared Value Using BWM and PROMETHEE. *Sustainability*, 15(11), p.8670. <https://doi.org/10.3390/su15118670>.
- Tajpour, M. and Hosseini, E., 2019. The effect of human and social capital on entrepreneurial activities: A case study of Iran and implications. *Entrepreneurship and Sustainability Issues*, 6(3). Available at SSRN: <https://ssrn.com/abstract=3682545>.
- Tayebnia, M., Karimi, A., Padash, H. and Yazdani, H., 2023. Developing the Framework of Entrepreneurship Education Ecosystem in Iranian Schools Using Soft System Methodology. *Journal of Systems Thinking in Practice*, 2(2), pp.1-32. <https://doi.org/10.22067/JSTINP.2023.81499.1052>.
- Wang, Y.D. and Zhu, L., 2017. Logical structure of enterprise human resource ecosystem based on self-organization theory. *Advanced Management Science*, 6(1), pp.37-41. <https://doi.org/10.7508/ams.2017.01.009>.
- Wieland, A., Stevenson, M., Melnyk, S.A., Davoudi, S. and Schultz, L., 2023. Thinking differently about supply chain resilience: what we can learn from social-ecological systems thinking. *International Journal of Operations & Production Management*, 43(1), pp.1-21. <https://doi.org/10.1108/IJOPM-10-2022-0645>.
- Yalenios, J. and d'Armagnac, S., 2023. Work transformation and the HR ecosystem dynamics: A longitudinal case study of HRM disruption in the era of the 4th industrial revolution. *Human Resource Management*, 62(1), pp.55-77. <https://doi.org/10.1002/hrm.22114>.
- Zaharov, D. & Lobacheva, A., 2020. Organization HR-Ecosystem Formation and Development. *Management*, pp.23-26.
- Zakharov, D.K., Ivanovskaya, L.V. and Pritoliuk, A.V., 2021. Ecosystems in Personnel Management in the Digital Economy. In *Socio-economic Systems: Paradigms for the Future* (pp. 1347-1354). Cham: Springer International Publishing. https://doi.org/10.1007/978-3-030-56433-9_140.
- Zare Mehrjerdi, Y. and Bakhshandeh, M., 2023. Evaluation Model of the Systems Thinking Level of the Organization (Case Study: an Iranian Oil Company). *Journal of Systems Thinking in Practice*, 2(2), pp.56-77. <https://doi.org/10.22067/JSTINP.2023.81262.1040>.