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Developing Scenarios for the Use of Artificial Intelligence in Human Resource Recruitment in Iran

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ABSTRACT

Undoubtedly, skilled and talented individuals, when considering joining an organization or taking on a new role, reflect on the organization's technological level, culture, leadership, and ethical climate to determine whether they can adapt to such an environment. A significant shortcoming in many companies is the inefficiency in attracting and selecting top talent. These organizations often invest substantial time in the recruitment process, yet their existing mechanisms lack the appeal necessary to draw in qualified candidates resulting in limited success in talent acquisition. This study aims to explore the role of artificial intelligence in the future of human resource recruitment in Iran. Through a thorough review of the relevant literature and expert interviews, the research identifies key variables influencing the recruitment process. Using the cross-impact analysis approach, the collected data were analyzed with MICMAC software, which revealed five critical drivers shaping the future of talent acquisition in the context of AI integration: data authenticity, access to job resources, resistance to change, cultural adaptation, and the complexity of AI-driven recruitment processes. These five key factors were further analyzed using Scenario Wizard software to construct plausible future scenarios. Experts completed uncertainty-based questionnaires to feed into the scenario-building process. As a result, the most compatible and strategic scenarios for the future of human resource recruitment alongside AI technologies were identified. Ultimately, after consulting with domain experts, the study culminated in the development of three main future scenarios.

1. INTRODUCTION

Many of today's problems stem from a failure to anticipate the future what we now experience as the "present." In clearer terms, current crises and challenges are perhaps the most compelling reason to contemplate the future. It is evident that today's crises are the result of failing to address obstacles before they escalate into serious issues [1].

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At present, employers are increasingly adopting modern processes in human resource management, especially in recruitment and selection [2]. A growing number of employers review social media platforms to trace digital footprints during hiring decisions. A digital footprint reflects the information generated and shared via any medium [3].

Human resources are among the most critical drivers of national development. If properly directed, HR can influence numerous development variables; conversely, if mismanaged, it may become a primary barrier to progress. A review of national development trajectories reveals that one common factor in successful development is human development itself, which inherently encompasses all economic, political, and cultural dimensions, approximating the concept of comprehensive development [4].

In today's competitive era, where digital transformation plays a crucial role in shaping modern enterprises, the quality of human capital remains a fundamental asset. Organizations with effective talent acquisition strategies are better positioned to leverage data analytics underpinning smart software platforms to accelerate and optimize the recruitment process. While recruitment is often complex and prone to human error and bias, artificial intelligence (AI) has traditionally been employed as a supplementary tool to manage this complexity [5].

AI methodologies have evolved from rule-based learning (also known as symbolic AI) to knowledge-based learning, known today as machine learning (ML). Machine learning uses computational models to emulate human behavior, allowing software systems to acquire and apply real-world knowledge and improve performance in assigned tasks. ML algorithms can be categorized based on their learning methods and data-driven modeling approaches: supervised learning, semi-supervised learning, and ensemble learning [6].

Over the past decade, machine learning techniques have become indispensable in natural language processing (NLP). These techniques are widely applied in speech recognition, document classification, text segmentation, part-of-speech tagging, word-sense disambiguation, named entity recognition, sentiment analysis, and translation core components of AI used in daily technologies, such as Apple's systems.

In the context of recruitment and selection, recent advances in machine learning, combined with increased computational power and accumulated data, have led to the emergence of new, AI-driven recruitment tools. These tools aid in candidate identification, engagement, and final selection. Typically, AI-based systems rely on supervised learning algorithms to match candidates with job roles. Supervised learning involves training algorithms on labeled datasets with known outcomes. The task of machine learning is to memorize training data, generalize from it, and apply the acquired knowledge to new data inputs. In recruitment, this means predicting optimal candidate-job matches based on recruiter-provided variables and input data [6].

In the context of recruitment and selection, recent advances in machine learning, combined with increased computational power and accumulated data, have led to the emergence of new, AI-driven recruitment tools (Kazim et al., 2021) [7]. These tools aid in candidate identification, engagement, and final selection. Typically, AI-based systems rely on supervised learning algorithms to match candidates with job roles (Gui et al., 2023)[8]. Supervised learning involves training algorithms on labeled datasets with known outcomes. The task of machine learning is to memorize training data, generalize from it, and apply the acquired knowledge to new data inputs (Abadi et al., 2016) [9]. Given these developments, the objective of the present study is to develop plausible future scenarios for the application of artificial intelligence in human resource recruitment in Iran.

2. LITERATURE REVIEW

The integration of Artificial Intelligence (AI) into human resource (HR) recruitment processes has garnered significant attention worldwide, presenting both opportunities and challenges. In the context of Iran, where the technological landscape is evolving, understanding the implications of AI adoption in recruitment is crucial. This literature review synthesizes existing research findings to explore the potential scenarios for AI use in HR recruitment in Iran, highlighting knowledge gaps and suggesting future research directions.

Recent studies indicate a growing recognition of AI's role in recruitment and selection processes. The work of Pan et al. (2021) identifies 11 distinct areas for AI application, including chatbots, screening software, and task automation tools [10]. This framework can provide a practical basis for Iranian organizations considering AI

integration, particularly as many companies in Iran are becoming increasingly tech-focused. However, the reluctance to invest in AI technology, attributed to cultural and financial barriers, presents challenges that need to be addressed (Albert, 2019) [11].

Moreover, a bibliometric analysis conducted by Palos-Sanchez et al. (2022) emphasizes the increasing relevance of AI in HRM, particularly in recruitment [12]. This analysis indicates that a significant portion of research is devoted to AI applications in recruitment, suggesting a ripe opportunity for Iranian organizations to explore these technologies further. The positive outlook for AI in HRM indicates that Iranian companies can leverage these advancements to enhance their recruitment processes.

The adoption of AI in recruitment is not without its complexities. The integration of the technology, organization, and environment (TOE) model with transaction cost theory sheds light on the facilitators and constraints influencing AI adoption. Notably, perceived complexity is a significant barrier that can hinder the effective use of AI in Iranian firms (Cao et al., 2023) [13]. However, enhancing technology competence and seeking regulatory support can foster an environment conducive to AI integration (Pan et al., 2021) [10].

Additionally, Ore and Sposato (2021) highlight the dual nature of AI in recruitment, emphasizing both its potential to automate routine tasks and the fears and distrust that may arise among recruitment professionals [14]. These findings suggest a nuanced understanding of the challenges faced when adopting AI in recruitment. Addressing these concerns will be vital for successful AI integration in Iranian organizations.

AI's ability to expedite recruitment processes and enhance decision accuracy presents a significant advantage for Iranian organizations (Bhardwaj et al., 2020) [15]. The practical implications of using AI tools in recruitment are profound, particularly as Iranian companies navigate an increasingly competitive job market. Moreover, the qualitative insights from existing studies can guide Iranian HR professionals in strategizing the integration of AI into their recruitment processes, ultimately enhancing efficiency and effectiveness in talent acquisition (Minerva & Giubilini, 2023) [16].

The complementary relationship between human teachers and AI, as explored by Jeon and Lee (2023), can also be applied to the HR context, where AI can assist HR professionals rather than replace them [17]. This perspective can help alleviate fears surrounding job displacement and foster a collaborative environment between AI tools and HR staff. Despite the promising findings, there are notable gaps in the existing literature. Most studies focus on the broader implications of AI adoption without delving into specific contextual factors unique to Iran. Future research should explore local perceptions and practices regarding AI in recruitment through qualitative approaches, such as interviews with HR specialists. This can provide valuable insights into the cultural and organizational factors that influence AI adoption in Iranian firms.

Furthermore, there is a need for empirical studies that assess the effectiveness of specific AI applications in Iranian recruitment processes. Understanding how AI technologies can be tailored to meet local needs and challenges will be crucial for their successful implementation. Researchers should also investigate the ethical considerations and potential biases associated with AI in recruitment, ensuring that the adoption of these technologies aligns with fair hiring practices.

The integration of AI into HR recruitment processes in Iran presents both opportunities and challenges. While existing studies provide a foundational understanding of AI's role in recruitment, there is a need for further research to address the unique contextual factors influencing AI adoption in Iranian organizations. By exploring these dynamics, HR professionals can develop tailored scenarios for AI integration, ultimately enhancing their recruitment strategies and improving talent acquisition outcomes. As the Iranian market continues to evolve, embracing AI technologies will be essential for organizations aiming to remain competitive in the global job market.

3. RESEARCH METHODOLOGY

This study is applied in terms of its objective and is analytical and exploratory in nature, based on modern methods in futures studies. A combination of both qualitative and quantitative models has been employed. The research was conducted in three stages:

Stage One involved the theoretical foundation of the study and was carried out using a library-documentary approach. Relevant theories in futures studies, along with literature pertaining to human resources and recruitment, were reviewed through books, scholarly articles, and other available information sources.

Stage Two focused on qualitative data collection through fieldwork using open-ended questionnaires and expert panel discussions. The panel consisted of 15 specialists in human resources and artificial intelligence. According to Dalkey, Van de Ven, and Gustafson (1975), selecting participants for the Delphi process depends on the required expertise and experience relevant to the research topic. They identify three qualifying groups for Delphi studies:

a) Senior decision-makers who use Delphi results,

b) Professional staff and their support teams within organizations,

c) Other respondents whose judgments on the topic are significant and influential.

Stage Three involved collecting quantitative data through weighted Delphi questionnaires. Subsequently, cross-impact analysis was performed to identify key driving forces and develop future scenarios. MICMAC software was utilized to analyze indicators and variables and determine the drivers, while Scenario Wizard software was used for scenario generation.

4. FINDINGS ANALYSIS

Table 1. Indicators Extracted from Literature Review and Expert Interviews

No.	Indicator
1	Reduction in time required to identify applicants' skills and knowledge
2	Decrease in interviewer bias
3	Motivation enhancement
4	Resistance to change
5	Importance of physical presence
6	Support in decision-making
7	Assistance in initial screening
8	Improved talent attraction
9	Reduction in workload
10	Access to a large pool of applicants
11	Access to extensive job opportunity resources
12	Reduction of negative impacts of interviews on individuals
13	Cost reduction
14	Legal and regulatory issues
15	Cultural adaptation
16	Traditional mindset
17	Necessity for data authenticity verification
18	Necessity of integrating machine outcomes with expert judgment
19	Exaggeration of candidate abilities
20	Potential unreliability and data security concerns
21	Need for essential infrastructure
22	Familiarity with expert system functions
23	Unfamiliarity of applicants with AI-driven recruitment processes
24	Need for high-speed internet access
25	Doubts regarding data credibility
26	Accuracy and precision
27	Complexity of recruitment due to expert systems integration
28	Duality between virtual and real-life personas

4.1. Results of Delphi Round 3

At the conclusion of the third Delphi round, based on the average expert ratings, indicators with an average score less than or equal to 3 indicating below-average importance were eliminated. As a result, a list of 13 high-impact factors, identified by the expert panel as having above-average influence on human resource demand, was finalized. These 13 drivers were then input into MICMAC software for cross-impact analysis and subsequent scenario development.

Table 2. List of 13 Key Factors Influencing Human Resource Demand

No.	Factors	Responses	Mean	Std. Deviation	Rank (by Mean)	Min	Max
1	Reduction in time to identify applicants' skills and knowledge	15	3.93	0.79	3	3	5
2	Reduction in interviewer bias	15	3.53	0.51	5	3	4
3	Duality of candidates' personalities in virtual vs. real spaces	15	3.10	1.00	8	1	4
4	Necessity of high-speed internet access	15	3.53	0.64	5	3	5
5	Need for essential infrastructure	15	3.46	0.83	6	2	5
6	Cultural adaptation and awareness	15	3.40	0.51	7	3	4
7	Access to a large number of applicants	15	3.66	0.61	9	1	3
8	Assistance in initial screening	15	4.20	0.67	1	3	5
9	Necessity to verify data authenticity	15	3.60	0.83	4	2	5
10	Complexity of recruitment process due to expert system integration	15	3.00	0.13	8	1	4
11	Access to a wide range of job opportunities	15	4.10	0.64	2	3	5
12	Unfamiliarity of applicants with AI-based recruitment processes	15	3.60	0.63	4	2	4
13	Resistance to change	15	2.66	0.72	9	1	4

Table 3. Kendall's Coefficient of Concordance Calculated in the Third Round of Delphi

Test Statistics	
N	15
Kendall's W[a]	0.360
Chi-Square	64.736
df	12
Asymp. Sig.	0.000
a. Kendall's Coefficient of Concordance	

Finally, the reliability of the questionnaire used in the third round of the Delphi process was calculated as shown in Table 4:

Table 4. Cronbach's Alpha for the Third Round of Delphi

Reliability Statistics	
Cronbach's Alpha	N of Items
0.717	13

4.2. Drivers

Drivers are sets of forces that shape the future and exert global or local influence across various domains. They indirectly impact a field's future and are typically beyond the control of that field. In other words, they operate within the broader problem environment. In this study, the key drivers have been identified and categorized as shown below:

Table 5. Categorization of Drivers

No.	Indicator	Code
1	Reduction in time to identify applicants' skills and knowledge	VAR1
2	Reduction in interviewer bias	VAR2
3	Duality of individual personality in virtual vs. real environments	VAR3
4	Necessity of high-speed internet access	VAR4
5	Establishment of necessary infrastructure	VAR5
6	Cultural adaptation and awareness	VAR6
7	Access to a large pool of applicants	VAR7
8	Assistance in initial screening	VAR8
9	Need for data authenticity verification	VAR9
10	Complexity of the recruitment process due to expert systems	VAR10
11	Access to a broad range of job opportunities	VAR11
12	Unfamiliarity with the recruitment process from the applicant's perspective	VAR12
13	Resistance to change	VAR13

To identify the scenario space, the relationships and interdependencies among the thirteen prioritized drivers were analyzed based on expert input. For this purpose, the MICMAC (Matrix of Cross-Impact Multiplications Applied to Classification) software was utilized. In MICMAC, drivers are compared in pairs and evaluated for the degree of influence they exert on each other based on expert judgments. A driver's influence on itself is rated as zero, and if no influence exists between two drivers, a score of zero is also assigned. Weak influence is rated as 1, moderate influence as 2, and strong influence as 3.

4.3. Types of Drivers

4.3.1. Critical Drivers (Key Variables)

These are the most significant and influential factors in AI-enabled human resource recruitment. The future of recruitment largely depends on these drivers and how they evolve. They include:

- Cultural adaptation
- Recruitment process complexity
- Access to a broad range of job opportunities
- Need for data authenticity verification

4.3.2. Intermediate (Linking) Variables

These variables serve as connectors between the main drivers and other factors, influencing the system's internal dynamics. They include:

- High-speed internet access
- Required infrastructure

4.3.3. Output Variables

These are mainly affected by other variables rather than acting as influencers themselves. They are outcomes of the system shaped by key drivers and indicators. These include:

- Assistance in initial screening
- Access to a large pool of applicants
- Duality of individual personality (virtual vs. real)

- Reduction in recruitment time
- Cost reduction
- Unfamiliarity with the recruitment process

4.3.4. Independent (Exogenous) Variables

These variables do not play a significant role in shaping the future within the scope of this study. Notably, no such variables were identified in this research.

5. RESULTS OF CALCULATIONS

The results obtained from the MICMAC software, including scores, positions, and influences of the research drivers, are presented in the following tables and figures. According to Table 6, the scores for each driver in terms of their row and column totals are shown:

Table 6. Scores of Drivers

No.	Variable	Total Row Score	Total Column Score
1	Reduction in time to identify applicants' skills and knowledge	12	27
2	Reduction in interviewer bias	15	23
3	Duality of individual personality in virtual and real spaces	15	21
4	Necessity of high-speed internet access	21	4
5	Establishment of necessary infrastructure	18	3
6	Cultural adaptation and awareness	24	18
7	Access to a large pool of applicants	15	16
8	Assistance in initial screening	16	20
9	Need for data authenticity verification	18	21
10	Complexity of recruitment process due to expert systems	19	15
11	Access to a broad range of job opportunities	17	16
12	Unfamiliarity with recruitment process from applicants' view	9	16
13	Resistance to change	18	17
	Totals	**217**	**217**

The figures below illustrate the position of each driver in relation to the others, based on their influence and dependence scores.

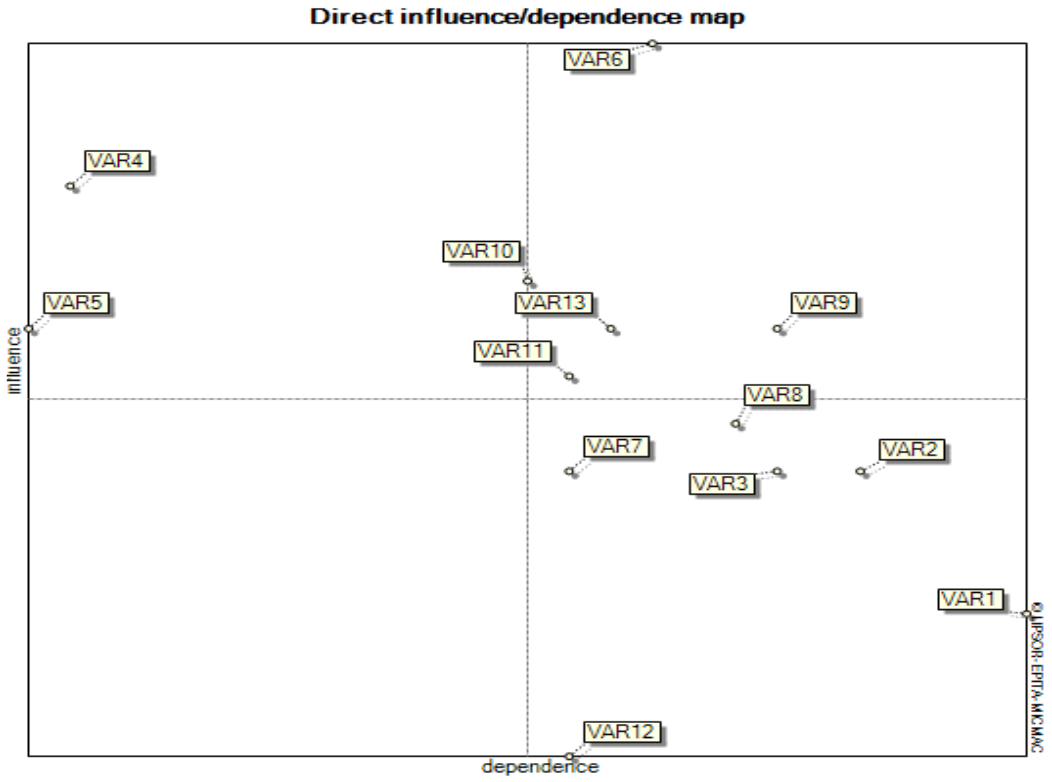

Fig. 1. Distribution and Positioning of Variables

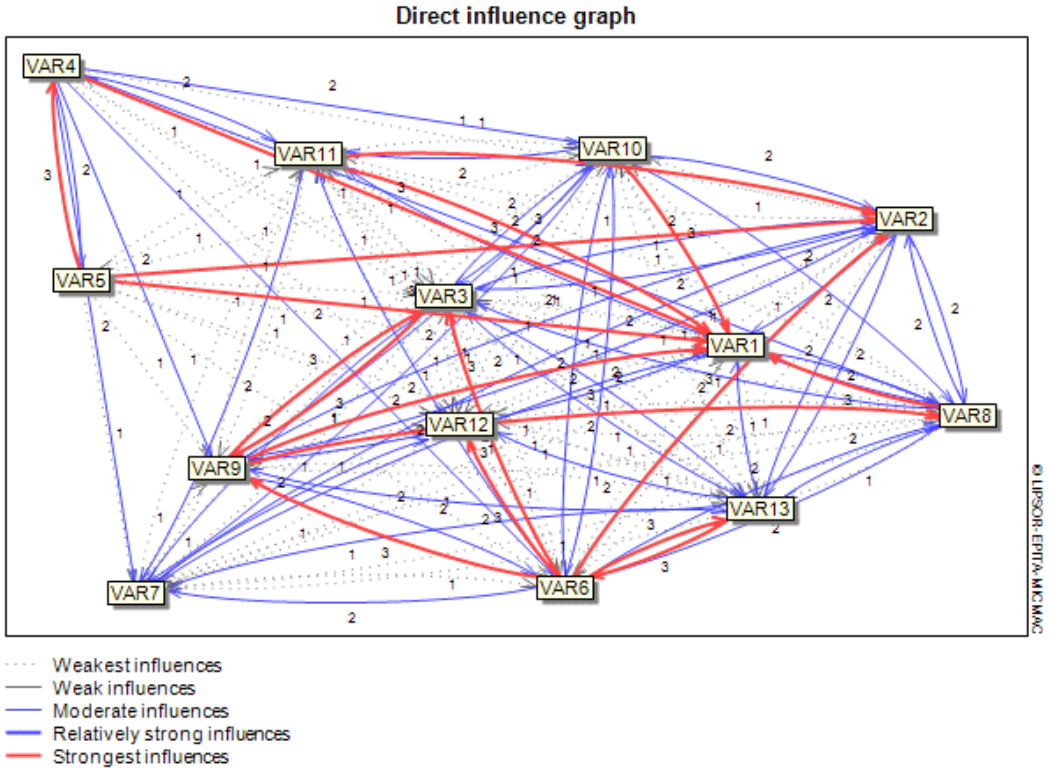

Fig. 2. Direct Influences Among Factors and Their Interrelationships

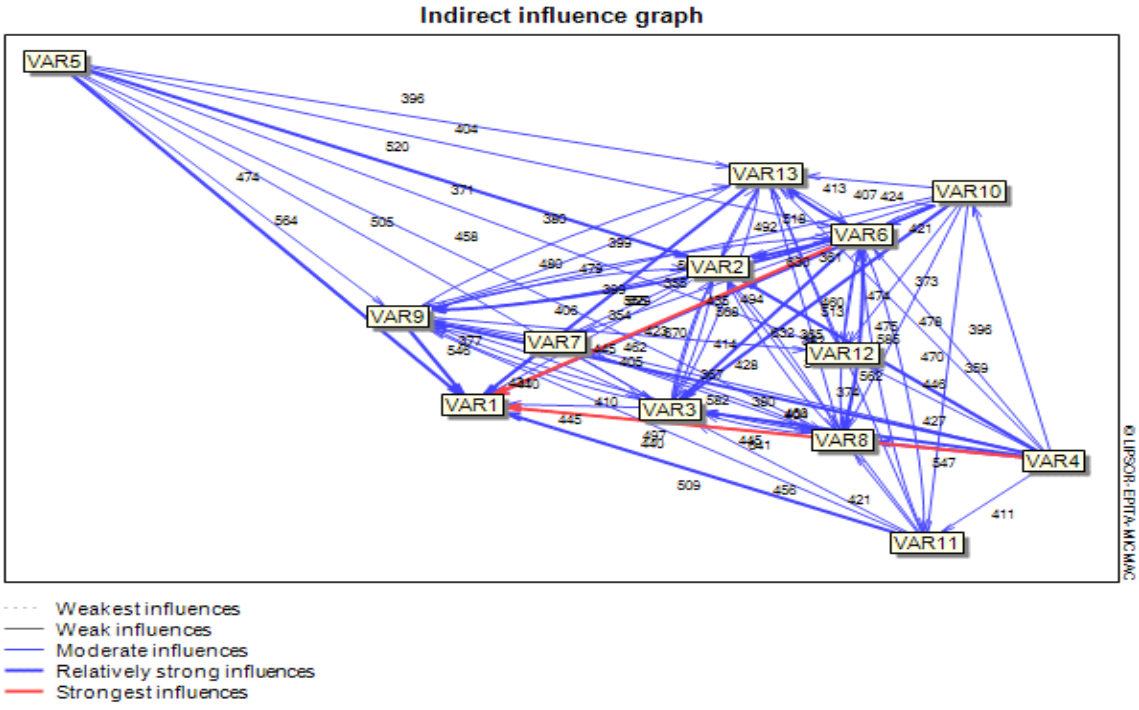

Fig. 3. Indirect Influences Among Factors and Their Interrelationships

5.1. Identification of Preferred Scenarios

After completing the cross-impact analysis structure using MICMAC software and identifying the critical (key) drivers, scenario assumptions should provide a well-configured dual-role representation of each descriptor in terms of its influence on the target. To develop plausible scenarios, the key descriptors derived from the five critical drivers identified via the cross-impact algorithm were codified according to matrix coding rules and presented to 10 experts. In other words, at this stage of the research, after identifying bipolar variables in the MICMAC analysis, experts were asked to define the state of each variable.

Table 7. Identification of Bipolar Variables

Key Factors	Possible States	Status Type
Cultural Adaptation	Increased public education on AI application culture	Favorable
	Increased applicant participation through AI-based recruitment	Favorable
	Lack of participation and mismatch with local applicant culture	Critical
Recruitment Process Complexity with AI	Provision of necessary training within organizations to reduce complexity	Favorable
	Simplification and revision of programs	Favorable
	Continuation of the current state	Static
Resistance to Change	Provision of training and cultural adaptation by managers	Favorable
	Increased involvement of managers and HR experts	Favorable
	Lack of participation and increased resistance	Critical
Access to Job Resources	Introducing and informing applicants about ease of access to recruitment resources	Favorable
	Increased use of AI in recruitment by organizations	Favorable
	Lack of awareness and inadequate access	Unfavorable
Data Authenticity	Improvement and standardization of data verification systems	Favorable
	Continuation of the current state	Static

Finally, three scenarios were proposed as the potential futures for the impact of AI on human resource recruitment:

Scenario 1: Resistant Culture

This scenario includes cultural adaptation characterized by a lack of participation and mismatch with local applicant culture; resistance to change manifested as lack of participation and increased resistance; and limited access to job resources due to inadequate awareness and access. In other words, this scenario depicts a situation where there is no adequate cultural adaptation or education about the benefits and use of AI in recruitment processes within organizations, resulting in resistance and non-participation by managers and staff.

Scenario 2: Supportive Development

In this scenario, cultural adaptation features increased applicant participation via AI-based recruitment; recruitment process complexity is addressed by providing necessary organizational training to reduce complexity; resistance to change is mitigated through managerial training and cultural adaptation; and access to job resources improves with greater organizational use of AI in recruitment. Here, enhanced cultural adaptation by organizational leaders leads to increased involvement, especially from managers and HR professionals, with training and initiatives focused on simplifying recruitment processes.

Scenario 3: Overcoming Resistance Through Access and Expertise

Similar to Scenario 2, this scenario emphasizes managers organizing seminars and conferences to improve ease of access to recruitment resources, aiming to overcome staff and managerial resistance. Additionally, necessary training is provided to reduce complexity and enhance employee expertise.

Table 8. Final Scenarios of Artificial Intelligence in the Future of Human Resource Recruitment

Scenario	Situation	Consistency value	Total Impact Score
Scenario 1	**Cultural Development**: Lack of engagement and incompatibility with local applicants' culture **Resistance to Change**: Lack of involvement and increased resistance **Access to Job Resources**: Poor awareness and inadequate access **Information Authenticity**: Continuation of the current situation	6	**36**
Scenario 2	**Cultural Development**: Increased engagement of applicants through AI-based recruitment **Complexity of AI-based Recruitment Process**: Providing necessary organizational training to reduce complexity **Resistance to Change**: Manager-led training and cultural initiatives **Access to Job Resources**: Increased use of AI in recruitment by organizations **Information Authenticity**: Improvement and standardization of authenticity verification systems	0	**36**
Scenario 3	**Cultural Development**: Increased engagement of applicants through AI-based recruitment **Complexity of AI-based Recruitment Process**: Providing necessary organizational training to reduce complexity **Resistance to Change**: Manager-led training and cultural initiatives **Access to Job Resources**: Informing applicants about the ease of access to recruitment resources **Information Authenticity**: Improvement and standardization of authenticity verification systems	0	**35**

6. CONCLUSION

Human resource managers in the current business environment face numerous challenges such as workforce diversity resulting from globalization, technological advancements, changing political and legal landscapes, and the evolution of information technology. The increasing pressure from these challenges compels HR managers to attract, retain, and develop talented employees. HR professionals must not ignore these challenges but rather design and implement innovative mechanisms to enhance human capital skills and competencies, preparing them to meet upcoming challenges.

This study examined the latest global technologies and their impact on human resource recruitment in Iran. Given the foresight approach and to prevent potential losses from future environmental changes affecting recruitment, scenario planning was employed. Initially, through an extensive literature review on global HR recruitment and foresight studies, all influential factors and environmental changes affecting recruitment software were gathered and subsequently validated and refined by experts in the field. Notably, the literature review was conducted through advanced searches in recent international articles on technologies and comprehensive examinations of all aspects influencing HR recruitment.

Alongside cross-impact analysis, after identifying final uncertainties, all possible scenarios were examined. Three scenarios were selected and reviewed by experts according to Table 8. Ultimately, the experts' views aligned with the outputs of the Scenario Wizard software. The scenarios were further refined and approved by the experts.

After collecting and categorizing the drivers and influential indicators through expert interviews, their importance (degree of influence on application software) and certainty (likelihood of occurrence in the future) were assessed. The questionnaire employed was standardized and implemented using a five-point Likert scale. Data were analyzed with SPSS software. Considering the strict approach, drivers with an average importance score above 3 were deemed significant. These were then divided into two groups based on certainty. Initially, significant drivers with low uncertainty (certainty scores above 3) were mapped as a set of mutually influential factors and analyzed through the cross-impact matrix method, examining causal loops.

At all stages, besides mean values, the numerical variance indicating the stability of expert opinions was also considered. If two drivers had identical importance or certainty scores, the driver with the lower variance was prioritized by experts within the Likert scale range.

Declaration

We acknowledge that we used ChatGPT to enhance the academic writing of our manuscript while ensuring the originality and integrity of our work.

Transparency Statement

The data supporting this study are available upon reasonable request to the corresponding author, subject to ethical and confidentiality considerations.

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Declaration of Interest

The authors declare that they have no competing interests.

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