

A Context-Specific Model for Transforming Payame Noor University into an Entrepreneurial University: Identification and Prioritization of Factors Affecting Human Resource Performance Using Fuzzy Delphi–AHP and BSC Methods

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ABSTRACT

The transition toward an entrepreneurial university requires a fundamental transformation in human resource performance management, particularly in distance education institutions such as Payame Noor University, which face unique structural and geographical challenges. The primary objective of this study was to develop a context-specific model for identifying and prioritizing the key factors affecting human resource performance during this transition. In terms of its purpose, the study was applied, and methodologically, it employed a sequential exploratory mixed-methods design. The statistical population consisted of academic and organizational experts, 15 of whom were selected through purposive sampling. In the first stage, critical factors were screened using the fuzzy Delphi technique. The factors were subsequently weighted using the analytic hierarchy process, and finally, they were evaluated within the Balanced Scorecard framework to produce a comprehensive importance–performance-based ranking. The findings indicated that five key factors play a role in this transition. Among these factors, “employee participation and empowerment,” with a final weighted score of 0.2125, and “employee training and development,” with a final weighted score of 0.1969, received the highest performance priorities. The principal innovation of this study is the presentation of the conceptual “Human Resource Empowerment Cycle” model, which indicates that, in the context of Payame Noor University, the development of cultural and skill-based infrastructure—the empowerment core—should precede the reform of control systems such as compensation and performance appraisal. The results of the study are also presented in the form of a three-phase operational roadmap for implementation by higher education policymakers.

Keywords: Entrepreneurial university, human resource performance, Payame Noor University, fuzzy Delphi, analytic hierarchy process, Balanced Scorecard.

Introduction

Universities are increasingly expected to move beyond their traditional functions of teaching and research and to assume a more active role in innovation, economic development, social value creation, and the commercialization of knowledge. This transformation has led to the emergence of the entrepreneurial university as an institutional model in which academic capacities are strategically mobilized to identify opportunities, develop innovative



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solutions, establish productive relationships with external stakeholders, and contribute to regional and national development. The entrepreneurial university is therefore not limited to the creation of spin-off firms or the registration of patents; rather, it represents a comprehensive organizational transformation involving strategy, culture, governance, human resources, infrastructure, external relations, and performance management. Early classifications of university entrepreneurship demonstrated that the field encompasses multiple streams, including technology transfer, academic entrepreneurship, entrepreneurial education, university–industry relations, innovation networks, and the development of entrepreneurial institutions (1). From this perspective, entrepreneurship becomes an institutional capability rather than an isolated academic activity. The entrepreneurial university accordingly requires a clear vision, measurable outcomes, organizational flexibility, and mechanisms through which teaching, research, and economic and social engagement can be integrated (2). The development of such a university depends on both formal organizational arrangements and informal cultural processes that encourage experimentation, opportunity recognition, cross-sector collaboration, and the productive use of knowledge (3).

The increasing importance of entrepreneurial universities is closely associated with changes in the social and economic environment of higher education. Governments, industries, communities, and students expect universities to respond more effectively to technological disruption, labor-market transformation, environmental challenges, regional inequalities, and the growing demand for applicable knowledge. Consequently, the third mission of universities has expanded from a relatively narrow emphasis on commercial outputs toward a broader concern with social impact, responsible innovation, sustainability, and impact-oriented entrepreneurship (4). Universities are also required to perform multiple and sometimes competing roles, including knowledge production, human capital development, regional leadership, innovation intermediation, and resilience building during periods of economic and social uncertainty (5). In knowledge-based economies, this expanded mandate requires institutional structures capable of connecting entrepreneurship with sustainability, interdisciplinary collaboration, and long-term socioeconomic development; however, universities often encounter structural obstacles such as fragmented governance, limited autonomy, weak incentive systems, and insufficient integration between academic and administrative units (6). At the organizational level, entrepreneurial orientation can improve academic innovation performance, but its effectiveness depends on institutional conditions, quality-assurance mechanisms, and the university's ability to translate strategic orientation into operational practices (7). These developments indicate that entrepreneurial transformation is not achieved merely by declaring an entrepreneurial mission; it must be embedded in institutional systems, resource allocation processes, and employee behavior.

Strategic alignment constitutes a central requirement for the transition toward an entrepreneurial university. Entrepreneurial initiatives may remain fragmented or symbolic when they are not aligned with the university's mission, internal capabilities, stakeholder expectations, and external ecosystem. A strategic alignment framework can help universities connect entrepreneurial objectives with research agendas, educational programs, knowledge-transfer mechanisms, governance structures, and regional innovation demands (8). Such alignment is particularly important because entrepreneurial universities operate within complex ecosystems composed of governmental institutions, firms, investors, civil society organizations, graduates, students, and knowledge intermediaries. Knowledge management is a crucial mechanism within these ecosystems because it facilitates knowledge creation, sharing, combination, application, and transfer among actors whose objectives and institutional logics may differ (9). Research on innovation and entrepreneurship in academic settings similarly shows that successful

entrepreneurial transformation depends on the interaction of individual, organizational, and environmental factors rather than on a single policy or structural intervention (10). Furthermore, strategic transformation in higher education is partly constructed through institutional narratives that define the university's identity, explain the need for change, and legitimize new priorities among internal and external stakeholders (11). Therefore, the entrepreneurial university must be understood as a strategically coordinated system in which policies, organizational stories, managerial processes, and human capabilities reinforce one another.

Although entrepreneurial university models frequently emphasize institutional structures, the actual implementation of entrepreneurship ultimately depends on individuals and groups within the university. Faculty members, administrators, managers, researchers, and professional staff interpret policies, allocate resources, establish networks, generate ideas, and determine whether entrepreneurial activities become institutionalized. Academic entrepreneurship is therefore shaped by organizational change at the individual level, including the willingness of academic actors to adopt new roles, participate in commercialization activities, collaborate across disciplinary boundaries, and respond to institutional incentives (12). The success of university spin-offs and other entrepreneurial ventures is also influenced by the human capital, prior experience, professional networks, and social connections of academic founders (13). Nevertheless, an excessive focus on commercial indicators may oversimplify academic entrepreneurship and neglect its broader institutional, educational, and social dimensions, which has led scholars to call for a reconsideration of how entrepreneurial academic activity is defined, supported, and evaluated (14). The quality of university education and research also affects graduate employability, suggesting that entrepreneurial transformation should improve not only organizational revenues but also the relevance of learning, the development of market-responsive competencies, and students' capacity to create value in changing labor markets (15). These considerations place human resources at the center of entrepreneurial university development.

Human resource management is especially significant because it provides the institutional mechanisms through which entrepreneurial strategy is translated into employee competencies, motivations, responsibilities, and performance. A university may establish incubators, innovation centers, entrepreneurship offices, and technology-transfer units, but these structures cannot function effectively without personnel who possess appropriate knowledge, entrepreneurial attitudes, collaborative capabilities, and decision-making authority. Human resource strategies for entrepreneurial universities must therefore address recruitment, professional development, employee participation, empowerment, performance appraisal, compensation, career advancement, and the alignment of individual objectives with institutional priorities (16). Strategic human resource management can strengthen corporate and organizational entrepreneurship by promoting knowledge management and organizational learning, both of which are essential for generating and implementing innovative ideas (17). The concept of the intrapreneurial university further highlights the role of employees who act entrepreneurially within existing institutional structures, create new initiatives, mobilize internal support, and gradually transform organizational processes from within (18). University support may also influence entrepreneurial behavior through psychological and educational mechanisms, indicating that organizational encouragement, capability development, and supportive environments can shape individuals' intentions and actions, including socially and environmentally responsible entrepreneurial behavior (19). In addition, the growing use of digital technologies in entrepreneurship education has expanded opportunities for flexible learning, simulation, networking, personalized instruction, and technology-enabled entrepreneurial

competency development (20). Thus, human resource performance should be managed as a strategic system that supports learning, initiative, experimentation, and institutional entrepreneurship.

Among the main components of this system, employee training and development are critical because entrepreneurial transformation requires competencies that may not have been emphasized in conventional university roles. These competencies include opportunity recognition, innovation management, interdisciplinary teamwork, digital literacy, design thinking, knowledge commercialization, project management, external networking, and the ability to operate under uncertainty. Training should consequently move beyond routine administrative instruction and become a continuous developmental process connected to the strategic mission of the entrepreneurial university. Employee participation and empowerment are equally important because innovative behavior is unlikely to flourish in highly centralized environments where personnel lack discretion, psychological safety, or access to decision-making processes. Empowerment allows academic and administrative employees to propose initiatives, experiment with new approaches, form cross-functional teams, and assume responsibility for entrepreneurial outcomes. It also encourages organizational commitment by converting employees from passive implementers of policy into active contributors to institutional change. In this regard, the identification and prioritization of leadership factors based on the lived experiences of higher education managers demonstrates that transformation is affected by context-sensitive managerial behaviors, participatory decision-making, organizational communication, and the capacity of leaders to mobilize individuals around change objectives (21). Therefore, training and empowerment are not independent interventions; together, they form a mutually reinforcing foundation for entrepreneurial performance.

Recruitment and selection represent another strategic dimension of human resource performance. Entrepreneurial universities require individuals who not only possess academic or technical qualifications but also demonstrate initiative, adaptability, creativity, networking capability, collaborative orientation, and a willingness to pursue new opportunities. The recruitment of entrepreneurial talent can strengthen the university's capacity to form partnerships, introduce innovative educational services, generate applied research, and respond to external needs. However, the presence of entrepreneurial employees alone does not guarantee entrepreneurial performance. Universities must also establish appraisal systems that recognize activities such as interdisciplinary collaboration, knowledge transfer, innovation, industry engagement, student entrepreneurship support, and the generation of social or economic impact. Traditional appraisal systems that focus almost exclusively on teaching hours, publication counts, administrative compliance, or seniority may discourage entrepreneurial behavior by failing to recognize the time, uncertainty, and collaborative effort involved in innovation. Compensation and reward systems must likewise be aligned with entrepreneurial goals. Financial rewards, promotion opportunities, recognition programs, research support, workload flexibility, and access to entrepreneurial resources can reinforce desired behaviors when they are perceived as equitable and strategically coherent. Nevertheless, these control and support mechanisms are likely to be effective only when employees have first acquired the necessary capabilities and have been meaningfully involved in institutional transformation.

The development of entrepreneurial universities has also received considerable attention in the Iranian higher education context. Studies have emphasized that the entrepreneurial university is required to respond to unemployment among graduates, weak university–industry linkages, limited commercialization of academic knowledge, financial constraints, and the need for a more active contribution to national development (22). Research on the characteristics of entrepreneurial universities in Iran has identified dimensions such as entrepreneurial

culture, flexible governance, supportive leadership, external interaction, innovative education, knowledge commercialization, and the mobilization of resources (23). Other investigations have distinguished between hard factors, including structures, regulations, technologies, and financing, and soft factors, including culture, motivation, leadership, trust, creativity, and human capabilities (24). Strategic analyses have similarly shown that the entrepreneurial university requires the integration of institutional mission, organizational culture, entrepreneurial education, research commercialization, networking, and supportive management (25). These findings reinforce the argument that human resource systems must be designed in accordance with the specific institutional, cultural, and regulatory conditions of Iranian universities rather than being directly imported from other higher education systems.

Internationalization is another element of entrepreneurial university development because it expands access to knowledge, research partnerships, talent, markets, and investment opportunities. Iranian universities seeking an entrepreneurial orientation need international strategies that connect mobility, joint research, global networking, educational innovation, and the commercialization of knowledge (26). At the same time, conceptual models of third-generation universities in Iran indicate that entrepreneurship should be integrated with education, research, innovation, economic value creation, and social responsibility (27). Institutional readiness is therefore a major concern. Universities may differ substantially in leadership commitment, organizational culture, infrastructure, financial capacity, legal flexibility, faculty motivation, external partnerships, and the maturity of their performance systems. Readiness-assessment models can help identify these gaps before universities initiate large-scale entrepreneurial reforms (28). The influence of entrepreneurial university dimensions on students' entrepreneurial behavior also demonstrates that institutional policies, educational content, role models, support services, and entrepreneurial culture can shape student outcomes (29). Accordingly, the transformation of human resources has implications beyond employee performance because faculty and staff behavior directly affects students' entrepreneurial learning, motivation, and opportunity recognition.

Recent Iranian studies have attempted to synthesize the strategic drivers and establishment mechanisms of entrepreneurial universities. Meta-synthesis findings have identified leadership, entrepreneurial culture, organizational structure, resource development, stakeholder engagement, innovation systems, and strategic human resource capabilities as recurrent drivers of transformation (30). Mechanisms proposed for establishing entrepreneurial universities also include policy support, structural flexibility, financial diversification, knowledge-based activity, networking, and the development of entrepreneurial competencies, particularly under conditions requiring institutional resilience and efficient resource utilization (31). Context-specific university models indicate that the relative importance of entrepreneurial dimensions may vary according to organizational history, regional conditions, disciplinary composition, managerial capacity, and stakeholder relationships (32). Moreover, analyses of the social roots of academic entrepreneurship failure warn that entrenched power structures, institutional oligarchy, resistance to creative destruction, unequal access to resources, and the protection of established interests may obstruct entrepreneurial initiatives even when formal policies support innovation (33). These studies demonstrate that an effective transformation model must not merely list desirable entrepreneurial characteristics; it must determine which factors should receive priority and how they should be sequenced within a realistic implementation process.

This requirement is particularly relevant to Payame Noor University because its distance-education orientation, extensive geographical distribution, diverse administrative units, large student population, and reliance on distributed academic and organizational resources create a distinctive context for entrepreneurial transformation.

In such an institution, standardized reforms may not produce uniform outcomes across locations, and managerial interventions must account for differences in local capabilities, communication processes, resource availability, and employee participation. A context-specific model is therefore necessary to identify the human resource factors that are both strategically important and capable of producing significant performance effects. The central challenge is not simply to determine whether training, empowerment, recruitment, appraisal, and compensation are relevant, but to establish their relative priorities and clarify the systemic relationships among them. Without such prioritization, managers may allocate resources to highly visible control systems while neglecting the cultural and capability-based foundations required for those systems to function.

The methodological integration of the fuzzy Delphi technique, the analytic hierarchy process, and the Balanced Scorecard offers a suitable response to this challenge. The fuzzy Delphi technique enables researchers to obtain expert consensus while accounting for ambiguity and uncertainty in linguistic judgments. AHP provides a structured procedure for conducting pairwise comparisons and calculating the relative weights of the identified factors. The Balanced Scorecard complements these techniques by evaluating factors across multiple strategic perspectives rather than relying on a single financial or operational criterion. In higher education, the Balanced Scorecard can connect institutional mission with measurable objectives in areas such as financial sustainability, stakeholder satisfaction, internal processes, and learning and growth (34). Its application is especially appropriate for entrepreneurial universities because entrepreneurial performance includes both tangible and intangible outcomes, including capability development, process innovation, stakeholder value, organizational learning, and long-term institutional sustainability. Combining AHP weights with Balanced Scorecard performance scores can consequently generate an importance–performance ranking that is more informative than either expert weighting or performance evaluation alone.

Despite the expansion of research on entrepreneurial universities, several gaps remain. Much of the literature has concentrated on conceptual dimensions, institutional characteristics, readiness factors, student entrepreneurship, commercialization, or university–industry relations, whereas the internal architecture of human resource performance has received comparatively less integrated attention. Existing studies often identify relevant factors without determining their relative priority, or they propose strategic models without connecting human resource practices to a multidimensional performance framework. Furthermore, limited research has examined how empowerment, training, recruitment, compensation, and performance appraisal should be sequenced during the entrepreneurial transformation of a geographically dispersed distance-education university. Addressing this gap requires a model that is empirically grounded in expert judgments, sensitive to the context of Payame Noor University, and capable of translating strategic priorities into an operational roadmap.

Accordingly, the aim of this study was to develop a context-specific model for transforming Payame Noor University into an entrepreneurial university by identifying, weighting, evaluating, and ranking the key factors affecting human resource performance through the integrated application of the fuzzy Delphi technique, the analytic hierarchy process, and the Balanced Scorecard.

Methods and Materials

The present study was conducted with the primary objective of “developing a context-specific model for transforming Payame Noor University into an entrepreneurial university through the identification and prioritization of factors affecting human resource performance.” Accordingly, in terms of its purpose, the research adopted an

applied-developmental orientation because it directly sought to provide an operational model for improving managerial processes at Payame Noor University while also contributing to the development of the theoretical literature on entrepreneurial universities.

In terms of its nature and implementation method, the study was based on a sequential exploratory mixed-methods approach. This approach enables the researcher to first explore the phenomenon in depth by employing qualitative methods and then validate and prioritize the findings through quantitative methods.

The research process began with an extensive review of the theoretical literature and previous studies. At this stage, the theoretical foundations associated with entrepreneurial universities, the strategic role of human resources, and performance evaluation models were carefully examined to extract an initial list of potential factors affecting human resource performance in relation to entrepreneurial objectives. This list served as the basis for designing the research instrument used in the subsequent stage.

In the second phase, the fuzzy Delphi technique was employed to identify and screen factors appropriate to the specific context of Payame Noor University. For this purpose, a panel of 15 academic and organizational experts was initially formed using judgmental purposive sampling. The first-round Delphi questionnaire, which included the factors extracted from the literature, was then distributed to the panel members, who were asked to conduct an initial evaluation and propose additional factors. After refining the list, the subsequent rounds were administered using questionnaires containing fuzzy scales represented by triangular fuzzy numbers to manage the uncertainty inherent in the experts' verbal judgments. This process continued until statistical consensus was achieved. The stopping criterion was the attainment of a predefined threshold, namely a defuzzified score of 0.70, for the mean expert ratings.

After the key factors were finalized through the Delphi procedure, the third phase of the study, involving the prioritization of the factors through the analytic hierarchy process (AHP), was initiated. First, the final factors were organized within a hierarchical structure, with the overall objective positioned at the highest level and the factors placed at the lower level. A pairwise comparison questionnaire based on Saaty's standard nine-point scale was then designed and distributed to the same panel of experts. After the data were collected, the experts' judgments were aggregated into a group pairwise comparison matrix using the geometric mean. The final weight of each factor was subsequently calculated using the eigenvector method.

In the final stage, the identified and prioritized factors were categorized within the four principal perspectives of the Balanced Scorecard—financial, customer, internal processes, and learning and growth—to develop a conceptual and practical model. This framework contributed to the presentation of a comprehensive and balanced model capable of clearly illustrating the relationships between human resource improvement initiatives and the university's strategic entrepreneurial objectives.

The statistical population consisted of a group of academic and organizational experts. The academic experts included faculty members holding the rank of associate professor or higher who specialized in human resource management, entrepreneurship, or higher education management. The organizational experts were selected from among the senior and middle managers of Payame Noor University who possessed relevant executive experience and an in-depth understanding of the institution's organizational challenges. In both phases of the research, the sample was selected using judgmental purposive sampling. The principal inclusion criteria for participation in the expert panel were scientific and professional expertise, familiarity with the specific research context of Payame Noor University, and willingness to participate actively in the multistage research process. Overall, a panel of 15

experts was formed. The same experts participated in both the Delphi and AHP stages to maintain the coherence and continuity of perspectives throughout the research process. The principal data collection instruments used in this study were as follows:

- **Library and documentary studies:** These were used to develop the theoretical foundations, review previous research, and extract the initial list of factors.
- **Fuzzy Delphi questionnaire:** This researcher-developed questionnaire was designed in an open-ended and semi-structured format during the first round and in a structured format using fuzzy Likert scales during subsequent rounds. For example, five- or seven-point scales with triangular or trapezoidal fuzzy equivalents were used to measure the importance of the factors. The validity of the questionnaire was evaluated by obtaining the opinions of the academic supervisors, advisors, and several experts. Given the consensus-based nature of the Delphi method, its reliability was assessed through the level of expert consensus and, where necessary, by calculating inter-rater reliability indices during the preliminary stages.
- **AHP pairwise comparison questionnaire:** This standardized questionnaire was based on Saaty's nine-point scale and was used to conduct pairwise comparisons among the factors and criteria. The validity of the questionnaire was established based on the standardized nature of the method, the predetermined hierarchical structure, and expert confirmation.

Findings and Results

This section presents the results obtained from applying the fuzzy Delphi technique, the analytic hierarchy process (AHP), and the Balanced Scorecard (BSC) to identify, prioritize, and evaluate the factors affecting human resource performance at Payame Noor University in relation to its transition toward an entrepreneurial university.

In the first stage of the study, the fuzzy Delphi technique was used to comprehensively identify the factors affecting human resource performance at Payame Noor University in relation to the achievement of entrepreneurial objectives. Following an extensive review of the theoretical literature and previous research, an initial list of factors was extracted. This list was presented in the form of a questionnaire to a panel of academic experts specializing in human resource management, entrepreneurship, and higher education, as well as senior managers of Payame Noor University. After several rounds of the fuzzy Delphi procedure, the experts' judgments were analyzed and consensus was achieved. Consequently, five key factors were identified and confirmed as the most influential determinants of human resource performance in the context of university entrepreneurship. These factors are presented in Table 1.

Table 1. Final Factors Affecting Human Resource Performance

No.	Factor
1	Employee training and development
2	Recruitment and selection of competent and entrepreneurial personnel
3	Performance appraisal based on entrepreneurial objectives
4	Employee participation and empowerment
5	Pay, benefits, and compensation system

After the final factors were identified through the fuzzy Delphi procedure, the analytic hierarchy process was used to determine the relative importance and weight of each factor.

- **Pairwise comparison matrix and calculation of the final factor weights:** The experts participating in this stage conducted pairwise comparisons among the five identified factors. Saaty's nine-point scale was used to determine the preference of one factor over another in relation to the overall research objective, namely improving human resource performance in an entrepreneurial university. Following data collection, an aggregated pairwise comparison matrix was constructed, and the final weight of each factor was calculated. The final weights are presented in Table 2.

Table 2. Final Weights of the Factors Affecting Human Resource Performance: AHP Results

Factor	Final AHP Weight
Employee training and development	0.25
Employee participation and empowerment	0.25
Recruitment and selection of competent and entrepreneurial personnel	0.20
Pay, benefits, and compensation system	0.15
Performance appraisal based on entrepreneurial objectives	0.15

As shown in Table 2, "employee training and development" and "employee participation and empowerment," each with a weight of 0.25, were identified as the most important factors. "Recruitment and selection of competent and entrepreneurial personnel," with a weight of 0.20, was ranked next. "Pay, benefits, and compensation system" and "performance appraisal based on entrepreneurial objectives," each with a weight of 0.15, occupied the subsequent priority positions.

- **Consistency ratio:** One of the important stages of AHP analysis is calculating the consistency ratio (CR) to examine the consistency and logical coherence of the experts' judgments. In this study, the consistency ratio was calculated after the aggregated pairwise comparison matrix was constructed. The resulting CR value was less than 0.10, indicating an acceptable level of consistency among the judgments and supporting the validity of the calculated factor weights.

At this stage, the identified and weighted factors were evaluated within the four perspectives of the Balanced Scorecard—financial, customer, internal processes, and learning and growth—to assess their performance across these strategic dimensions.

- **Performance of the factors across the four BSC perspectives:** The experts assigned a performance score to each of the five key factors in each of the four BSC perspectives, assuming the optimal implementation of that factor. The scores were determined using an appropriate scale, such as a scale ranging from 0 to 1 or a percentage-based scale. The results are presented in Table 3.

Table 3. Performance Scores of the Factors Across the Four Balanced Scorecard Perspectives

Factor	AHP Weight	Financial	Customer	Internal Processes	Learning and Growth
Employee training and development	0.25	0.80	0.70	0.75	0.90
Recruitment and selection of competent and entrepreneurial personnel	0.20	0.70	0.80	0.65	0.85
Performance appraisal based on entrepreneurial objectives	0.15	0.60	0.60	0.70	0.75
Employee participation and empowerment	0.25	0.90	0.90	0.80	0.80
Pay, benefits, and compensation system	0.15	0.75	0.85	0.70	0.65

As shown in Table 3, the experts assigned different performance scores to each factor across the four BSC perspectives. For example, "employee training and development" received its highest score of 0.90 in the learning and growth perspective, whereas "employee participation and empowerment" received a score of 0.90 in both the

financial and customer perspectives. These raw scores formed the basis for the subsequent calculations used to determine the final ranking of the factors.

- **Final scores and factor ranking:** To achieve a comprehensive evaluation and final ranking of the factors, the AHP weights were combined with the mean performance scores of the factors across the four BSC perspectives. The “final score” of each factor was calculated by averaging its scores across the four BSC perspectives. Subsequently, the “weighted score” of each factor was calculated by multiplying its AHP weight by its final score. The weighted score reflects the final priority of each factor by simultaneously considering its inherent importance, as represented by the AHP weight, and its potential performance across the various BSC dimensions. The results are summarized in Table 4.

Table 4. Final Scores, Weighted Scores, and Rankings of the Factors Affecting Human Resource Performance

Factor	Weight (W_i)	Mean Score (S_i)	Weighted Score ($WS_i = W_i \times S_i$)	Rank
Employee participation and empowerment	0.25	0.8500	0.212500	1
Employee training and development	0.25	0.7875	0.196875	2
Recruitment and selection of competent and entrepreneurial personnel	0.20	0.7500	0.150000	3
Pay, benefits, and compensation system	0.15	0.7375	0.110625	4
Performance appraisal based on entrepreneurial objectives	0.15	0.6625	0.099375	5

This section provides a detailed analysis and interpretation of the quantitative findings presented in the previous section. Based on these analyses, a conceptual model and an operational roadmap for the transition of Payame Noor University toward an entrepreneurial university are subsequently presented.

The final prioritization results, obtained by combining the AHP weights with the BSC performance scores, provide important insights into the pathway for transforming human resources at Payame Noor University. The most important finding was that “employee participation and empowerment,” with a weighted score of 0.2125, received the highest priority, followed by “employee training and development,” with a weighted score of 0.1969. This result indicates that, from the experts’ perspective, the foundation of entrepreneurial transformation is primarily dependent on the establishment of an appropriate cultural and skill-based environment. The first-place ranking of participation and empowerment confirms that the transition toward an entrepreneurial university requires a change in employees’ mindsets from merely performing routine duties to developing a sense of ownership and actively participating in the achievement of strategic objectives. This objective can be realized through the delegation of authority, the involvement of employees and faculty members in decision-making processes, and the establishment of a psychologically safe environment in which innovative ideas can be proposed. This finding is consistent with Clark’s identification of an “expanded developmental periphery” as one of the principal components of entrepreneurial university transformation (Clark, 1998). Employee training and development was ranked immediately afterward, emphasizing the necessity of updating the knowledge and skills of human resources in areas such as innovation management, knowledge commercialization, and design thinking. Together, these two factors constitute the principal empowerment core, without which other initiatives are unlikely to achieve the required level of effectiveness.

“Recruitment and selection of competent and entrepreneurial personnel,” which ranked third with a weighted score of 0.1500, emphasizes the strategic importance of inputs into the human resource system. This finding indicates that, while empowering existing personnel, the university must also revise its recruitment processes and

seek to attract individuals who possess entrepreneurial personality characteristics and competencies. Finally, the placement of the “compensation system,” with a weighted score of 0.1106, and “performance appraisal,” with a weighted score of 0.0994, in fourth and fifth positions highlights an important managerial consideration. Although these systems are essential for directing and reinforcing desired behaviors, their relatively lower priorities may indicate that, from the experts’ perspective, a strong cultural and skill-based foundation must first be established through participation and training before reward and appraisal systems are reformed. In other words, support systems become effective only when capabilities exist to be supported and when meaningful performance has been developed that can be evaluated and rewarded. The fifth-place ranking of performance appraisal may specifically reflect weaknesses in the existing appraisal systems and the need to align them with new entrepreneurial indicators.

Based on these findings, an integrated conceptual model and an operational roadmap are proposed to strategically guide the transition of Payame Noor University. This framework translates the quantitative results of the study into a coherent action plan. The proposed model, entitled the “Human Resource Empowerment Cycle for University Entrepreneurship,” is presented in Figure 1 and is based on a systemic and dynamic relationship among the identified factors. At the center of the model is the “empowerment core,” which consists of the two highest-ranked factors: employee participation and empowerment, and employee training and development. This core is supported by an “enabling environment,” represented by the recruitment and selection of entrepreneurial talent. This input provides the human capital required for the successful implementation of empowerment programs. Finally, the “governance and support system,” comprising the compensation system and performance appraisal, completes the cycle. By providing feedback and incentives, this system reinforces and sustains the innovative behaviors generated by the empowerment core. Through feedback loops, it also communicates new training and motivational requirements back to the system.

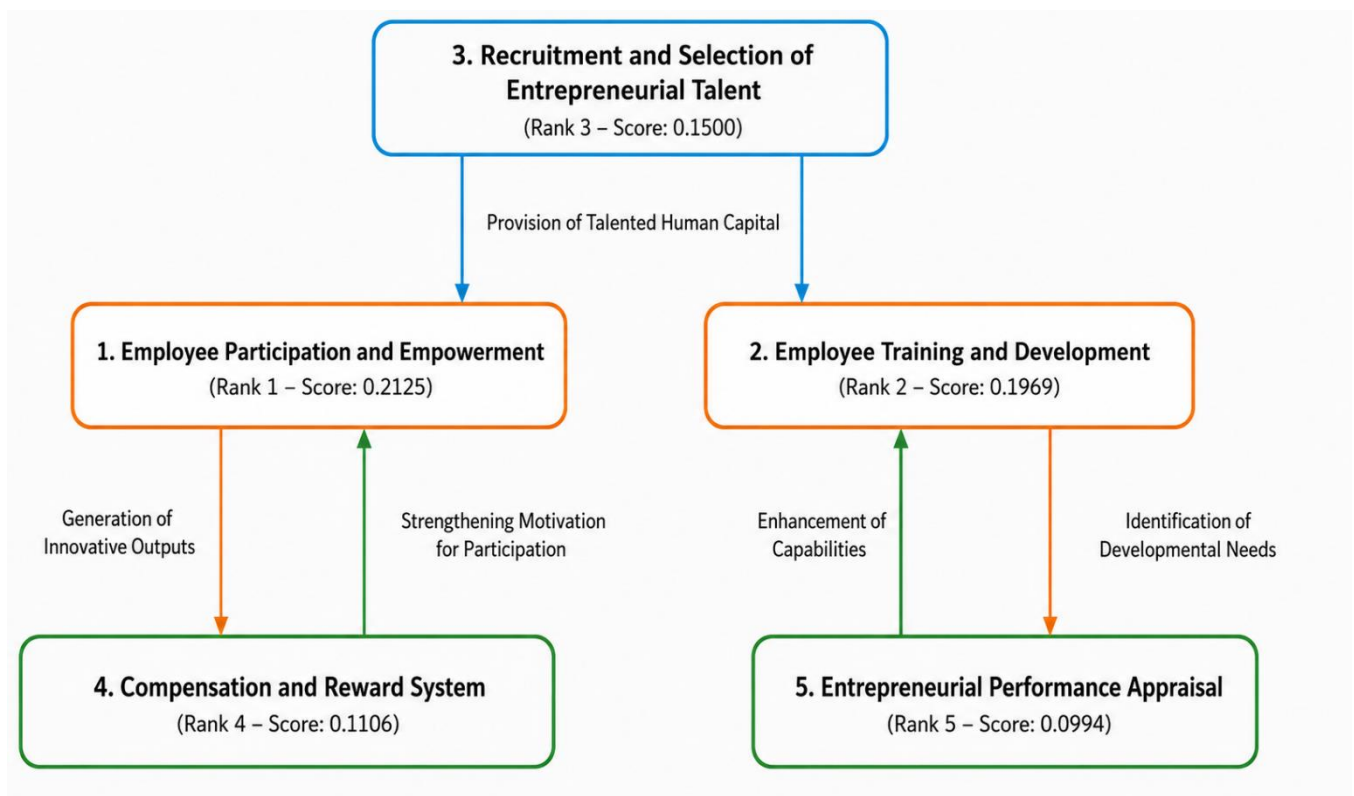


Figure 1. Human Resource Empowerment Cycle Model for University Entrepreneurship

A three-phase operational roadmap is proposed for implementing this model.

Phase 1: Foundation Building and Empowerment. This phase focuses on the two principal factors of participation and training and seeks to establish a strong cultural and skill-based foundation. Actions undertaken during this phase include establishing innovation councils, launching an employee suggestion system, and implementing focused training programs.

Phase 2: Reinforcement and Institutionalization. This phase concentrates on completing the human resource management cycle through the implementation of revised recruitment processes, the development of an “entrepreneurial reward package,” and the formulation of performance appraisal indicators. During this phase, the support systems are fully designed and implemented on a pilot basis.

Phase 3: Monitoring, Optimization, and Maturity. This phase emphasizes the complete integration of the systems and the establishment of a culture of continuous improvement. At this stage, the performance appraisal system is fully implemented, and its results are used to revise training and reward programs so that the university can develop into a dynamic learning organization in the field of entrepreneurship. This roadmap enables managers to allocate resources purposefully and systematically to areas that are expected to generate the greatest effectiveness.

Discussion and Conclusion

The present study developed a context-specific model for transforming Payame Noor University into an entrepreneurial university by identifying, weighting, and evaluating the principal factors affecting human resource performance. The fuzzy Delphi results led to the identification of five key factors: employee training and development, recruitment and selection of competent and entrepreneurial personnel, performance appraisal based on entrepreneurial objectives, employee participation and empowerment, and the pay, benefits, and compensation system. The AHP findings showed that employee training and development and employee participation and empowerment received the highest relative weights, each with a value of 0.25. Recruitment and selection of competent and entrepreneurial personnel ranked next with a weight of 0.20, whereas the compensation system and entrepreneurial performance appraisal each received a weight of 0.15. The consistency ratio was below 0.10, confirming the acceptable consistency of the experts' pairwise judgments. When the AHP weights were integrated with the mean performance scores across the four Balanced Scorecard perspectives, employee participation and empowerment received the highest weighted score of 0.2125, followed by employee training and development with a weighted score of 0.1969. Recruitment and selection of competent and entrepreneurial personnel ranked third with a weighted score of 0.1500, while the compensation system and performance appraisal ranked fourth and fifth with weighted scores of 0.1106 and 0.0994, respectively. These results indicate that the entrepreneurial transformation of Payame Noor University should begin with the development of employee agency, participation, and competencies before comprehensive changes are introduced into formal control and reward systems.

The first and most important finding was the superior ranking of employee participation and empowerment. This result suggests that the entrepreneurial transformation of a university cannot be achieved solely through formal structural changes, new policies, or the establishment of entrepreneurship centers. Rather, transformation depends on whether faculty members, managers, and administrative employees perceive themselves as active participants in institutional change and possess sufficient authority to initiate, develop, and implement innovative ideas. The entrepreneurial university is fundamentally characterized by organizational flexibility, distributed initiative, strategic

interaction with external stakeholders, and the ability of internal actors to respond creatively to emerging opportunities (2, 3). Employee empowerment creates the organizational conditions required for these characteristics by reducing excessive centralization, increasing decision-making discretion, and strengthening employees' sense of ownership over university objectives. The result is also consistent with the view that entrepreneurial transformation occurs through changes in the behavior and roles of individuals inside academic institutions, because organizational entrepreneurship is ultimately enacted by actors who accept new responsibilities and participate in novel forms of collaboration (12).

The importance of participation and empowerment is particularly relevant to the intrapreneurial university. Intrapreneurship refers to entrepreneurial behavior occurring within an established organization and involves employees who identify opportunities, mobilize resources, build internal coalitions, and introduce new programs or processes. The process model of the intrapreneurial university emphasizes that entrepreneurial transformation emerges through the gradual interaction of individual initiatives, organizational support, and institutional learning (18). Therefore, the first ranking of empowerment in the present study indicates that Payame Noor University needs to establish mechanisms through which employees can move beyond the passive implementation of centrally determined procedures. Innovation councils, participatory committees, suggestion systems, interdisciplinary teams, delegated authority, and psychologically safe communication channels may enable personnel across geographically dispersed units to contribute more effectively to entrepreneurial initiatives. This interpretation is also consistent with research showing that university support can influence entrepreneurial behavior by strengthening individuals' perceived capabilities, motivation, and willingness to engage in innovative and socially responsible activities (19).

The finding regarding employee empowerment also reflects the strategic importance of organizational culture. In rigid administrative cultures, entrepreneurial ideas may be suppressed by bureaucratic routines, fear of failure, hierarchical communication, or limited access to decision makers. Previous studies in the Iranian higher education context have identified entrepreneurial culture, supportive leadership, flexibility, trust, creativity, and participatory governance as important soft components of entrepreneurial universities (23, 24). Conversely, institutional oligarchy, concentration of power, resistance to creative destruction, and the protection of established interests can obstruct academic entrepreneurship even when formal policies appear to encourage innovation (33). The present finding therefore implies that empowerment must involve more than the formal delegation of tasks. It should include changes in managerial attitudes, access to information, acceptance of constructive disagreement, tolerance of reasonable risk, and recognition of locally generated initiatives. These conditions are especially important in Payame Noor University, where organizational dispersion may create distance between central policymakers and employees working in regional and local units.

Employee training and development received the second-highest final priority and shared the highest AHP weight with participation and empowerment. This finding indicates that entrepreneurial transformation requires systematic investment in human capital. Employees cannot be expected to perform entrepreneurial roles unless they possess the knowledge and skills necessary to identify opportunities, manage innovation, interact with industry, commercialize knowledge, design new educational services, use digital technologies, and participate in interdisciplinary projects. The strategic human resource literature emphasizes that training and development are essential components of human resource strategies designed to support the entrepreneurial university (16). Strategic human resource management can also strengthen organizational entrepreneurship indirectly through

knowledge management and organizational learning, because trained personnel are more capable of generating, sharing, and applying knowledge in innovative ways (17). Accordingly, the high ranking of training and development confirms that the entrepreneurial university is a learning-intensive organization whose performance depends on continuously renewing the competencies of its academic and nonacademic personnel.

This result is also aligned with studies emphasizing the importance of knowledge management and technology-enabled learning within entrepreneurial ecosystems. Entrepreneurial ecosystems depend on the effective circulation, integration, and application of knowledge among universities, firms, public organizations, and other stakeholders (9). Therefore, training programs should not be restricted to conventional administrative or disciplinary instruction. They should include innovation management, entrepreneurial finance, intellectual property, industry engagement, project development, digital entrepreneurship, collaborative problem solving, and sustainability-oriented entrepreneurship. Technology has also become increasingly important in entrepreneurship education by enabling flexible learning, simulations, digital collaboration, personalized instruction, and access to wider networks (20). Because Payame Noor University has substantial experience in distance education, it may possess an institutional advantage in developing scalable digital professional-development programs for personnel across geographically dispersed units. The high performance score of training and development in the learning and growth perspective of the Balanced Scorecard further supports this interpretation.

The combined priority of empowerment and training suggests that these two factors should be regarded as an integrated empowerment core rather than as independent human resource practices. Training without empowerment may produce knowledgeable employees who lack the authority or institutional support required to apply what they have learned. Conversely, empowerment without training may provide employees with discretion but insufficient capability to make informed entrepreneurial decisions. Their joint importance is consistent with strategic alignment approaches, which emphasize that entrepreneurial objectives must be connected to internal capabilities, organizational processes, and employee behavior (8). It is also consistent with meta-synthesis findings identifying leadership, entrepreneurial culture, human capabilities, innovation systems, and stakeholder engagement as interconnected drivers of the entrepreneurial university (30). The proposed Human Resource Empowerment Cycle therefore reflects a systemic logic: training develops capability, empowerment enables application, participation generates innovation, and feedback from entrepreneurial activities identifies new developmental needs.

Recruitment and selection of competent and entrepreneurial personnel ranked third. This result indicates that the transformation of existing personnel must be accompanied by changes in the quality of new entrants into the university's human resource system. Entrepreneurial universities need individuals who demonstrate adaptability, creativity, networking competence, initiative, tolerance of uncertainty, collaborative capacity, and an orientation toward opportunity recognition. Research on academic spin-offs has shown that entrepreneurial outcomes are strongly affected by the human capital, prior experience, and social networks of the individuals involved (13). Similarly, broader research on university entrepreneurship shows that individual competencies interact with institutional structures and environmental conditions to shape entrepreneurial performance (10). The third-place ranking of recruitment therefore does not indicate that it is unimportant; rather, it suggests that recruitment should operate as an enabling input to the empowerment core. Entrepreneurial talent provides the university with personnel who can benefit from training, participate in decision making, and initiate innovative activities.

The importance of recruitment is also supported by research on graduate employability, entrepreneurial education, and university internationalization. Universities that prioritize research quality, relevant education, and labor-market responsiveness are better positioned to improve employability and generate societal value (15). Likewise, the entrepreneurial dimensions of universities influence students' entrepreneurial behavior through role models, curricula, support mechanisms, and organizational culture (29). Recruiting faculty members and managers with entrepreneurial competencies may therefore influence not only internal organizational performance but also the entrepreneurial development of students. Internationalization can further expand access to talent, knowledge networks, collaborative research, and entrepreneurial opportunities (26). For Payame Noor University, revised recruitment criteria could include evidence of interdisciplinary collaboration, applied research, digital competence, industry engagement, innovative teaching, and the ability to develop external partnerships, in addition to conventional academic qualifications.

The pay, benefits, and compensation system ranked fourth. This finding should not be interpreted as evidence that compensation is unimportant. Rather, it indicates that reward systems are likely to be most effective after employees possess relevant competencies and have meaningful opportunities to participate in entrepreneurial activity. Compensation can reinforce desirable behavior by recognizing innovation, collaboration, knowledge commercialization, external engagement, and the development of entrepreneurial programs. However, a reward system cannot independently create an entrepreneurial culture when employees lack authority, skills, resources, or managerial support. This sequencing is compatible with the distinction between hard and soft factors in entrepreneurial university development: formal rewards, procedures, and structures are necessary, but their effectiveness depends on supportive cultural and behavioral conditions (24). The lower ranking of compensation may also reflect the experts' awareness that financial incentives alone can produce narrow or instrumental behavior if they are not aligned with broader educational, research, and social missions.

The fifth ranking of performance appraisal based on entrepreneurial objectives similarly reflects the need to establish entrepreneurial capabilities before applying formal measurement systems. Performance appraisal is indispensable because traditional university indicators may fail to recognize innovation, interdisciplinary activity, social impact, entrepreneurship education, knowledge transfer, and engagement with external stakeholders. Contemporary perspectives on the entrepreneurial university have called for broader metrics that move beyond narrow commercialization outcomes and incorporate institutional, social, and developmental impacts (4, 14). The relatively low weighted score of performance appraisal may therefore indicate both the weakness of existing evaluation systems and the difficulty of measuring entrepreneurial contributions. It may also suggest that introducing entrepreneurial indicators too early could produce formal compliance rather than genuine behavioral change. Once employees have been trained, empowered, and provided with opportunities to engage in entrepreneurial initiatives, appraisal systems can more validly assess their contributions.

The application of the Balanced Scorecard provided a multidimensional understanding of these priorities. Entrepreneurial university performance cannot be adequately evaluated through financial results alone, because many relevant outcomes emerge through stakeholder satisfaction, internal-process improvement, learning, innovation, and long-term institutional capacity. The Balanced Scorecard enables universities to connect their mission and strategy with indicators across financial, customer, internal-process, and learning-and-growth perspectives (34). In the present study, employee participation and empowerment received high scores in both the financial and customer perspectives, suggesting that empowered employees may contribute to more efficient

resource use, improved responsiveness, stronger stakeholder relationships, and innovative service delivery. Training and development received its highest score in learning and growth, which is theoretically consistent with its role in strengthening intellectual capital and organizational learning. These patterns support the use of BSC–AHP integration as a means of combining the strategic importance of factors with their expected multidimensional performance.

The findings also align with models emphasizing institutional readiness and context-specific transformation. Universities differ in governance, resources, culture, infrastructure, leadership, and external relationships; therefore, entrepreneurial transformation should be based on an assessment of institutional strengths and weaknesses (28). Iranian studies have similarly proposed that the establishment of entrepreneurial universities requires a combination of policy support, structural flexibility, entrepreneurial competencies, knowledge-based activity, and stakeholder networking (27, 31). The present study extends these perspectives by specifying the relative priority of human resource factors in Payame Noor University and translating them into a three-phase roadmap. The first phase establishes cultural and skill-based foundations, the second institutionalizes recruitment, rewards, and appraisal, and the third integrates the systems through monitoring and continuous improvement. This sequence is compatible with the broader view that entrepreneurial transformation is an evolutionary organizational process rather than a single administrative intervention (25, 32).

Overall, the findings indicate that the proposed Human Resource Empowerment Cycle provides a coherent explanation of how entrepreneurial human resource performance may develop. Entrepreneurial talent enters the system through recruitment and selection, gains relevant competencies through training, and applies those competencies through participation and empowerment. Innovative outputs are then reinforced through compensation, while performance appraisal provides feedback regarding achievements, deficiencies, and future developmental needs. This circular relationship is consistent with the concept of a strategically aligned entrepreneurial university in which human resources, organizational learning, stakeholder relationships, and performance systems function as mutually reinforcing components (8). It also reflects the need for universities to balance economic, educational, social, and regional-development roles in changing environments (5, 6). The model therefore contributes to the literature by moving beyond a static list of entrepreneurial university characteristics and presenting a prioritized, sequential, and operationally interpretable human resource framework.

This study had several limitations that should be considered when interpreting the findings. First, the expert panel consisted of 15 academic and organizational specialists, and although this sample size was appropriate for the fuzzy Delphi and AHP procedures, it may not fully represent the diversity of perspectives found across all branches, provinces, academic disciplines, and administrative levels of Payame Noor University. Second, the findings were based primarily on expert judgments rather than direct behavioral, financial, or longitudinal performance data. The performance scores assigned within the Balanced Scorecard framework therefore represent informed assessments of potential effects rather than observed outcomes following actual implementation. Third, the use of the same expert panel in both the Delphi and AHP stages strengthened continuity but may also have increased the possibility of shared cognitive framing across the analytical stages. Fourth, the study focused specifically on human resource performance and did not directly model other influential components such as technology infrastructure, financial autonomy, legal regulations, university–industry partnerships, and regional entrepreneurial ecosystems. Finally, the context-specific nature of the model limits the direct generalizability of the ranking to other universities with different missions, structures, governance systems, and resource conditions.

Future studies should validate the proposed model using larger and more heterogeneous samples that include faculty members, administrative employees, students, industry representatives, entrepreneurs, and policymakers. The relationships among the five factors could be tested through structural equation modeling to determine their direct, indirect, and reciprocal effects on entrepreneurial university outcomes. Longitudinal and quasi-experimental studies are also needed to assess whether the implementation of empowerment, training, recruitment, compensation, and appraisal reforms leads to measurable changes in innovation, knowledge commercialization, stakeholder satisfaction, student entrepreneurship, and financial sustainability. Comparative studies could examine whether the factor weights differ among distance education, comprehensive, technical, medical, and private universities. Future research could also integrate other multicriteria decision-making methods, such as DEMATEL, ANP, fuzzy TOPSIS, or best–worst method, to examine causal relationships and compare prioritization results. In addition, researchers should develop and validate specific performance indicators for each stage of the proposed roadmap and investigate how digital transformation, organizational culture, leadership style, and regional ecosystem maturity moderate the effectiveness of the model.

Payame Noor University should begin implementation by establishing a central steering committee responsible for translating the proposed model into measurable programs, responsibilities, timelines, and performance indicators. In the first phase, managers should prioritize employee participation and capability development by creating innovation councils, cross-functional working groups, digital suggestion platforms, and targeted training programs in innovation management, entrepreneurship, industry engagement, knowledge commercialization, digital education, and project development. In the second phase, recruitment criteria should be revised to include entrepreneurial and collaborative competencies, while pilot compensation packages should recognize innovation, external engagement, teamwork, and the development of new educational or commercial services. Performance appraisal indicators should then be redesigned to incorporate entrepreneurial objectives without weakening the university's teaching and research missions. In the third phase, the five human resource systems should be integrated into a unified digital monitoring framework based on the four Balanced Scorecard perspectives. Pilot implementation should begin in selected provincial centers, and the resulting evidence should be used to refine the model before university-wide expansion.

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Authors' Contributions

All authors equally contributed to this study.

Declaration of Interest

The authors of this article declared no conflict of interest.

Ethical Considerations

All ethical principles were adhered in conducting and writing this article.

Transparency of Data

In accordance with the principles of transparency and open research, we declare that all data and materials used in this study are available upon request.

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