Designing an Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations (Case Study: Research Institute of Petroleum Industry)

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Abstract

The primary objective of this study is to design an employee performance management model with a human resource development approach in research and technology organizations, with a specific focus on the Research Institute of Petroleum Industry. The research follows a mixed-methods approach (qualitative-quantitative). In addition to a document review, thematic analysis was conducted using MAXQDA14 software to identify the factors influencing employee performance management within the framework of human resource development. The statistical population for the qualitative phase included faculty members specializing in public administration, human resource management, and oil and gas disciplines, as well as managers of the Research Institute of Petroleum Industry. A total of 19 semi-structured interviews were conducted until theoretical saturation was reached. Based on these interviews, four dimensions, 23 components, and 108 indicators were identified. For the quantitative phase, a descriptive-survey method was employed. The statistical population comprised all managers, supervisors, and experts working at the Research Institute of Petroleum Industry. Using Cochran's sampling formula, a total of 232 participants were selected. The results indicated that the internal organizational dimension had the highest significance (coefficient = 0.964), while the meta-organizational dimension had the lowest significance (coefficient = 0.827). Additionally, economic factors were identified as the most critical component (coefficient = 0.915), whereas the reward system was deemed the least significant (coefficient = 0.640). Ultimately, the final model was developed and validated, consisting of five main dimensions: philosophy and objectives, theoretical foundations, executive principles, evaluation system, and implementation mechanisms.

Keywords: *Employee performance management, human resource development, organizational productivity.*

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1. Introduction

Today, human resources, as the most important and valuable asset of organizations, play a vital role in creating core capabilities and driving organizational growth. Therefore, human resource planning and management are essential to address skill and training needs, ultimately leading to improved employee performance [1]. Employee performance management holds particular significance in organizations as it helps identify and rectify misaligned behaviors between employees and organizational objectives. Establishing an efficient performance management system reduces errors and enhances productivity [2]).

There is a strong relationship between human resource performance management and human resource development, as both domains collectively contribute to organizational improvement and growth. This is particularly crucial in research and technology organizations, where human resources are knowledge-based. Enhancing employee performance and human resource development in such organizations not only improves internal performance but also contributes to increased organizational productivity and resilience [3].

Research indicates that many research and technology organizations in resource-rich countries, particularly in industries such as oil and gas, despite having adequate financial resources and technological infrastructure, exhibit lower productivity compared to their global competitors. This issue is primarily attributed to weaknesses in employee performance management and the inability to develop human resources in alignment with the strategic needs of organizations [4, 5]. These challenges largely stem from gaps in employee performance evaluation processes and the lack of appropriate mechanisms to integrate performance management with human resource development [6, 7]. Many existing models treat these two areas separately, yielding suboptimal outcomes. Although various evaluations are conducted, they do not effectively translate into human resource development processes, preventing employees from receiving the necessary feedback to enhance their performance and competencies [3, 8]. This deficiency reduces the effectiveness of development initiatives and hinders the achievement of long-term organizational goals. Consequently, a comprehensive and integrated approach is required—one that simultaneously ensures precise performance evaluation and the enhancement of workforce competencies while aligning both processes with organizational strategic goals. Given the complexity of knowledge-intensive and technical research and technology organizations, human resource development must be structured in a way that enables personnel to effectively contribute to research and strategic objectives [4, 9-11].

A review of the literature indicates that human resource development plays a crucial role in enhancing employee performance and organizational sustainability. Khodadadi Didani et al. (2024) designed and validated a human resource development model for ensuring supply chain sustainability in the shipping industry, concluding that employee empowerment positively influences job satisfaction and motivation, ultimately leading to organizational sustainability [6]. Aghaei Malek Abadi et al. (2023) proposed a conceptual performance management model with a sustainable human resource development approach in agricultural extension services, identifying three dimensions for performance management and four for sustainable human resource development [10]. Despite the extensive research on performance management in public and private organizations, a notable research gap exists regarding performance management models in research and technology organizations, particularly at the Research Institute of Petroleum Industry. This gap highlights the need for new models that specifically address the dimensions, components, and implementation processes of performance management in research and technology organizations with a human resource development approach.

One of the key challenges in achieving the country's strategic objectives in the oil and gas industry is the impact of international sanctions and the limitations arising from restricted access to advanced technologies and global knowledge. International sanctions against Iran have led to the absence of multinational technology firms in the country, directly affecting the execution of oil industry development projects and creating significant obstacles in meeting strategic goals. The Research Institute of Petroleum Industry, as the country's leading research center in the oil and energy sector, plays a crucial role in scientific innovation, implementing policies related to economic resilience, and addressing the technological needs of domestic industries. The effective performance of knowledge-based employees at the institute not only enhances scientific and technical output but also significantly contributes to reducing dependence on foreign technology, increasing self-sufficiency, and improving national economic productivity. In this regard, employee performance management with a human resource development approach can enhance both individual and

group performance in research organizations such as the Research Institute of Petroleum Industry. Consequently, it strengthens internal capabilities and capacities in addressing economic challenges and sanctions. In this context, designing a comprehensive performance management model aligned with a human resource development approach can significantly enhance research processes and contribute to achieving national strategic objectives. The Research Institute of Petroleum Industry, due to its unique circumstances, requires both optimal and cohesive performance while also developing adaptability and flexibility in response to environmental challenges such as project delays and slow progress. Scientific research in this field can identify key components and indicators of performance management and provide solutions for improving evaluation processes and employee performance, ultimately leading to enhanced research quality, innovation, and economic productivity in organizations such as the Research Institute of Petroleum Industry. Therefore, designing a comprehensive model tailored to the needs of such organizations in the field of performance management—particularly with an emphasis on human resource development—is a critical necessity. Research and technology organizations like the Research Institute of Petroleum Industry can leverage modern performance management models not only to enhance employee performance quality but also to contribute to economic resilience, scientific and technological self-sufficiency, and national revenue generation. This study aims to take a significant step toward improving managerial processes and human resource development in research organizations. The primary objective of this study is to design a comprehensive and operational model for performance management that fosters human resource development in research and technology organizations. Specifically, this study seeks to answer the following questions:

1. What is the structure of a performance management model with a human resource development approach in research and technology organizations, particularly the Research Institute of Petroleum Industry, and what dimensions, components, and indicators does it encompass?
2. What is the current status of these dimensions and components, and how should they be prioritized?
3. What is the ranking of evaluation indicators based on the Decision-Making Trial and Evaluation Laboratory (DEMATEL) structural network?
4. To what extent is the proposed model considered appropriate and effective by experts?

2. Methodology

Given the nature of this study, a mixed-methods research design (qualitative-quantitative) was employed. The qualitative phase utilized thematic analysis, while the quantitative phase adopted a descriptive-survey approach. The primary research instruments included semi-structured interviews, a researcher-developed questionnaire, and data analysis software such as MAXQDA, SPSS, and Excel.

In the qualitative phase, based on a review of the literature and the theoretical framework, thematic analysis was conducted to identify indicators (basic themes), components (organizing themes), and dimensions (global themes). The study participants included experts in human resource management and public administration, as well as senior managers from the Research Institute of Petroleum Industry, who either held relevant academic degrees or had authored books, articles, or conducted teaching in the field. The inclusion criteria required experts to have at least three years of university-level experience in human resource management and public administration or a doctoral degree in human resource management within public organizations or related research fields.

Qualitative data collection was conducted through semi-structured interviews, using a non-random, fully purposive snowball sampling method. The sample size was determined based on theoretical saturation, which was reached at 19 participants. The interviews were conducted during the summer and fall of 2023. The validity of the research instruments was confirmed by experts, and qualitative reliability was established using the intra-theme reliability coefficient (0.68).

To examine the impact of each variable on others and to distinguish between influencing and influenced components within the study variables, the fuzzy DEMATEL method was applied, ensuring that the overarching research objectives could be achieved. This method identifies the relationships between dependent and independent indicators, whether individually or collectively. DEMATEL analyzes the interrelations between indicators by categorizing them into influencing and influenced factors.

Furthermore, to assess data robustness, qualitative data validity was evaluated using interpretive research criteria, including credibility, dependability, confirmability, and trustworthiness, as well as theoretical criteria such as

generalizability, coherence, comprehensibility, and controllability.

For the quantitative phase, a descriptive-survey approach was employed. The data collection tool was a researcher-developed questionnaire designed based on the qualitative analysis results. Simple random sampling was used, and the statistical population included managers, supervisors, and experts from the Research Institute of Petroleum Industry, with a sample size of 232 participants determined using Cochran's formula. Data description was performed using SPSS software, while structural equation modeling (SEM) was analyzed using PLS software.

3. Findings and Results

To answer the research questions, semi-structured interviews were conducted with experts and senior managers from the Research Institute of Petroleum Industry. Thematic analysis was applied to identify the dimensions and components of employee performance management with a human resource development approach in research and technology organizations. Through this method, 30 initial codes were extracted. After multiple reviews and merging of similar codes over several stages, a total of 108 indicators (basic themes), 23 components (organizing themes), and 4 dimensions (global themes) were identified.

Question One: What dimensions, components, and indicators does the employee performance management model with a human resource development approach in research and technology organizations encompass?

In this section, 4 dimensions, 23 components, and 108 indicators were identified:

Table 1. Final List of Basic Themes, Organizing Themes, and Global Themes Derived from Semi-Structured Interviews and the Research Background

Row	Dimension	Component	Indicator	Interviewee Code	Theme Code
1	Individual	Ability	Sense of achievement because of one's job	I10, I6, I5, I1, I7	C 1
2			Experience	I9, I5, I4, I2, I11	C 2
3			Talent and ability	I3, I4, I11, I5	C 3
4			Relevance of education and in-service training to one's job	I10, I9, I1, I6, I11	C4
5		Performance Evaluation	Awareness of work quality	I6, I8, I10, I3, I4	C 5
6			Receiving necessary work feedback	I10, I8, I1, I3, I4	C 6
7			Awareness of positive and negative work results	I3, I1, I5, I4, I6, I11, I9, I10	C 7
8			Awareness of ways to improve performance	I11, I9, I10, I4, I5	C 8
9			Submitting work reports to superiors	I6, I1, I2	C 9
10		Professional Ethics	Adherence of decisions to ethical principles	I11, I7, I10, I3, I8	C 10
11			Fairness of decisions	I8, I3, I5, I4, I2	C 11
12			Assignments based on regulations and competencies	I4, I3, I2, I8, I6	C 12
13			Trustworthiness of managers	I3, I9, I5, I4, I2	C13
14		Creativity and Innovation	Number of new ideas and solutions proposed	I5, I11, I4, I3	C14
15			Level of receptiveness to new ideas and support for innovators	I1, I2, I9, I7, I5	C 15
16			Allocating specific budgets for new initiatives	I7, I3, I9, I10, I11	C16
17			Modeling creativity and innovation from other organizations	I1, I9, I13	C17
18			Holding creativity training programs	I3, I7, I3	C18
19	Intra-Organizational	Role Clarity	Correct understanding of work objectives	I11, I3, I14, I2, I9	C 19
20			Asking about the proper way to do the job	I6, I7, I5, I4	C 20
21			Organizational efforts to ensure employees' correct understanding of work	I10, I3, I8, I2	C 21
22		Motivational Factors	Compensation corresponding to credentials and experience	I7, I5, I1, I7	C 22
23			Provision of employee welfare facilities	I11, I8, I4, I9	C 23
24			Providing employees with information	I4, I2, I6	C24
25			Employee satisfaction with organizational membership	I8, I2, I9, I1	C 25
26			Opportunities for career advancement	I6, I9, I3, I15	C 26
27			Perception of fairness in salaries and benefits	I2, I1, I10, I7	C 27
28			Extent of employees' reliance on the organization in their personal lives	I5, I8, I7, I6, I4	C 28

29			Organizational attention to employees' families	I5, I6, I4, I13	C 29
30			Recognition and appreciation of employees in front of colleagues	I1, I2, I11, I7, I10	C 30
31		Training	Holding research-oriented courses and seminars	I2, I6, I10, I9	C 31
32			Alignment of knowledge and education with the relevant job	I11, I9, I10, I4, I5	C32
33			Extent of specialized and general reading related to the job	I6, I1, I2	C 33
34			Ability to use computer and internet technology	I11, I7, I10, I3, I8	C 34
35		Leadership Style	Precisely defining responsibilities	I8, I3, I15, I14, I2	C 35
36			Emphasis on instructions	I13, I9, I5, I4, I2	C 36
37			Issuing instructions to employees with necessary explanations	I5, I8, I7, I6, I4	C 37
38			Engaging employees in decision-making	I11, I9, I3, I4, I5	C38
39			Allowing employees to act at their discretion	I6, I5, I2	C 39
40		Work Environment	Extent of others' interference in one's work	I9, I7, I10, I3, I8	C 40
41			Quietness of the work environment	I8, I3, I5, I4, I2	C 41
42			Psychological state of the work environment	I4, I3, I5, I9, I6	C 42
43		Reward System	Base salary contingent on abilities	I10, I6, I5, I1, I7	C 43
44			Job benefits contingent on competencies and encouraging development	I3, I11, I5	C 44
45			Rewards and motivational factors based on individual performance	I9, I5, I4, I2, I11	C 45
46		Performance Measurement	Identifying employee capabilities	I3, I4, I11, I5	C 46
47			Improving employee task execution	I10, I8, I3	C 47
48		Employee Communications	Open and extensive communication with managers	I10, I9, I1, I6, I11	C 48
49			Job security	I6, I8, I10, I3, I4	C 49
50			Information sharing	I10, I8, I1, I13, I4	C 50
51			Attitude measurement	I3, I1, I5, I4, I6	C 51
52			Work discipline and correction of undesirable employee behavior	I3, I4, I11, I5	C 52
53			Expression and resolution of complaints	I10, I9, I1, I6, I11	C 53
54		Rules and Regulations	Adherence to the law	I6, I8, I10, I3, I4	C 54
55			Familiarity with laws and responsibilities	I10, I8, I1, I3, I4	C 55
56			Separate scheduling behind the manager's office door	I2, I6, I10, I9	C 56
57			Punitive and incentive regulations	I11, I9, I10, I4, I5	C 57
58			Developing an organizational code of ethics aligned with the organizational climate	I6, I1, I2	C 58
59			Fairness in implementing regulations	I11, I7, I10, I3, I8	C 59
60			Feasibility of regulations	I10, I6, I5, I1, I7	C 60
61			Establishing an ethics committee for human research	I9, I5, I4, I2, I11	C61
61*		Organizational Climate	Covert interpersonal relationships within the organization	I3, I4, I11, I5	C 62
63			Arrangement of the work environment	I10, I9, I1, I6, I11	C 63
64			Informal relationships within the organization	I6, I8, I10, I3, I4	C 64
64*			Different opinions and perspectives in the workplace	I10, I8, I1, I3, I4	C 65
66		Job Program Design	Employee participation	I3, I1, I5, I4, I6	C 66
67			Job analysis	I11, I9, I10, I14, I5	C 67
68			Job description	I6, I1, I2	C 68
69			Appropriate organizational position (career promotion)	I11, I7, I10, I3, I8	C 69
70			Job flexibility	I8, I3, I5, I14, I2	C 70
71		Health and Well-Being	Welfare programs	I14, I3, I2, I8, I6	C 71
72			Ergonomics	I3, I9, I5, I14, I2	C 72
73			Employee health and safety training	I5, I11, I4, I3	C 73
74		Training and Development	Orientation training at the time of employment	I1, I12, I9, I7, I5	C 74
75			Teamwork (forming teams)	I7, I13, I9, I10, I11	C 75
76			On-the-job training	I1, I9, I13	C 76
77			Job rotation (suitable for career development)	I3, I7, I3	C 77
78			Evaluation of training programs	I11, I3, I14, I2, I9	C 78
79	Extra-Organizational	Organizational Support	Allocating sufficient budget for various departments	I6, I7, I5, I14	C 79
80			Providing required job tools and equipment	I10, I3, I8, I2	C 80
81			Mutual support among different departments	I7, I5, I1, I7	C 81

82			Support for employees undertaking difficult tasks	I11, I8, I14, I9	C 82
83		Economic Factors	Sanctions and societal economic instability	I4, I2, I6	C 83
84			Employees' economic circumstances	I8, I2, I9, I1	C 84
85			Unbridled inflation	I6, I9, I3, I21	C85
86		Socio-Cultural Factors	Low values and beliefs in society due to stereotypical views of public organizations	I2, I1, I10, I7	C86
87			Low prevailing culture in research areas due to irrational thinking	I5, I8, I7, I6, I4	C87
88			Insufficient cultural and motivational programs at the organizational level	I5, I6, I14, I13	C 88
89			Lack of government support for social and cultural activities at the Ministry of Petroleum	I1, I2, I11, I7, I10	C 89
90			Lack of employee and managerial participation in cultural and social activities	I12, I6, I10, I9	C 90
91			Rapid technological changes and new communication/media tools impacting employees' work	I11, I9, I10, I4, I5	C 91
92		Recruitment	Equal opportunities for men and women	I6, I1, I2	C 92
93			Changing recruitment methods	I11, I7, I10, I3, I8	C 93
94			Hiring top graduates	I8, I3, I5, I4, I2	C 94
95			Competency-based appointments	I3, I9, I5, I4, I2	C 95
96			Employee transfers	I5, I8, I7, I6, I4	C96
97			Selection via interviews	I11, I9, I3, I4, I5	C 97
98			Non-interference of personal interests	I6, I5, I2	C 98
99			Re-employing retired individuals	I9, I7, I10, I3, I8	C 99
100			Fair recruitment	I8, I3, I5, I4, I2	C 100
101			Public announcements	I4, I3, I5, I9, I6	C 101
102			Introducing qualified employees to officials by organizational staff	I10, I6, I5, I1, I7	C 102
103	Meta-Organizational	Human Resource Planning	Future job forecasting for individuals	I3, I11, I5	C 103
104			Forecasting human resource supply	I9, I5, I4, I2, I11	C 104
105			Forecasting professional requirements	I3, I4, I11, I5	C 105
106		Hiring and Selection	Planned recruitment	I6, I7, I5, I14	C 106
107			Proper selection and employment	I10, I3, I8, I2	C 107
108			Targeted internal recruitment	I7, I5, I1, I7	C 108

Question Two: How is the Current Status of the Dimensions and Components of Employee Performance Management with a Human Resource Development Approach in Research and Technology Organizations?

To evaluate the current status of each research dimension, a one-sample t-test was conducted to analyze respondents' perspectives. The summary of the one-sample t-test results, based on the mean views of participants, is presented in the following:

Table 2. Dimensions and Components T-Test Analysis

Dimensions/Components	Mean	t-Value	Significance Level	Lower Bound (CI: 95%)	Upper Bound (CI: 95%)
Individual Dimension	3.275	9.538	0.000	0.270	0.410
Intra-Organizational Dimension	3.000	12.047	0.000	0.409	0.568
Extra-Organizational Dimension	3.390	11.031	0.000	0.355	0.510
Meta-Organizational Dimension	3.330	14.151	0.000	0.454	0.600
Ability	3.240	8.084	0.000	0.292	0.479
Performance Evaluation	3.410	13.684	0.000	0.458	0.611
Professional Ethics	3.270	19.002	0.000	0.637	0.784
Creativity and Innovation	3.180	13.872	0.000	0.512	0.682
Role Clarity	3.000	15.292	0.000	0.389	0.504
Motivational Factors	3.280	10.412	0.000	0.283	0.415
Training	3.270	11.654	0.000	0.292	0.479
Leadership Style	3.340	12.584	0.000	0.536	0.611
Work Environment	3.450	13.252	0.000	0.467	0.784
Reward System	3.980	11.982	0.000	0.867	0.682
Performance Measurement	3.170	10.143	0.000	0.657	0.504
Employee Communication	3.230	13.011	0.000	0.364	0.415
Rules and Regulations	3.260	14.146	0.000	0.754	0.479

Organizational Climate	3.310	12.434	0.000	0.657	0.611
Job Program Design	3.010	9.863	0.000	0.454	0.784
Employee Health and Well-being Factors	3.070	8.392	0.000	0.542	0.682
Training and Development	3.510	10.193	0.000	0.524	0.504
Organizational Support	3.470	11.435	0.000	0.545	0.415
Economic Factors	3.210	12.493	0.000	0.554	0.479
Socio-Cultural Factors	3.670	13.675	0.000	0.665	0.611
Recruitment	3.210	12.938	0.000	0.356	0.784
Human Resource Planning	3.220	11.678	0.000	0.386	0.682
Hiring and Selection	3.440	10.825	0.000	0.757	0.504
Main Category	3.433	11.723	0.000	0.365	0.512

The mean scores of respondents' perspectives on the individual, intra-organizational, extra-organizational, and meta-organizational dimensions were obtained, and the values for all four dimensions were higher than the midpoint of the Likert scale. The significance value was also determined to be zero, which is smaller than the 0.05 error threshold. Therefore, the observed mean is statistically significant, and the t-statistic is greater than the critical value of 1.96. Additionally, both the upper and lower confidence interval bounds are greater than zero (positive). Based on these statistical findings, with 95% confidence, it can be concluded that all four dimensions have a relatively suitable status, but they fall short of the optimal range (mean of 4 and 5).

Question Three: How are the dimensions and components of employee performance management with a human resource development approach in research and technology organizations prioritized in the Research Institute of Petroleum Industry?

To answer this question, 232 questionnaires were distributed to the main sample, and the results were analyzed using structural equation modeling (SEM).

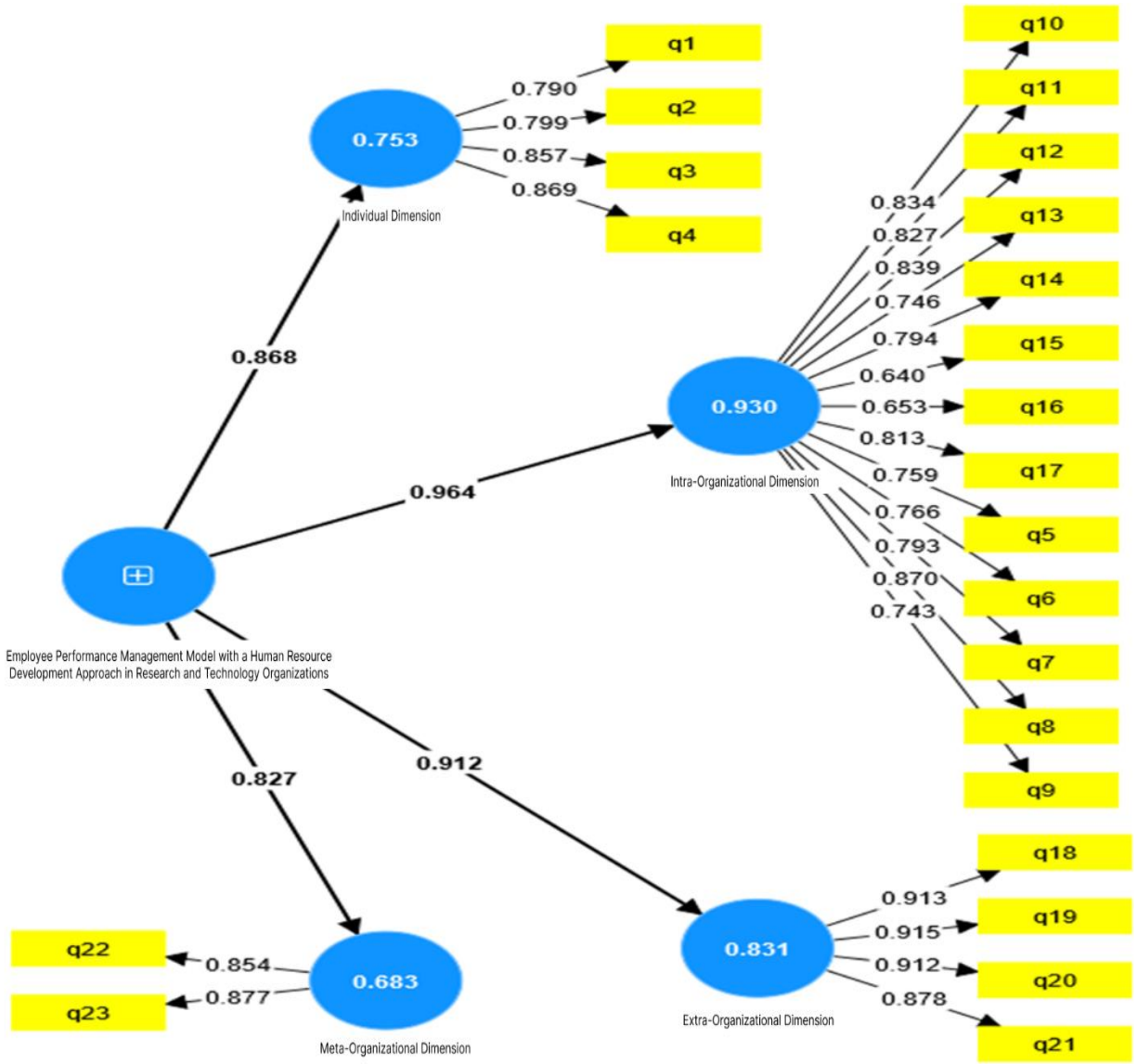

q1
q2
q3
q4
0.790
0.799
0.857
0.869
0.753
Individual Dimension
0.868
0.964
0.930
Intra-Organizational Dimension
q10
q11
q12
q13
q14
q15
q16
q17
q5
q6
q7
q8
q9
0.834
0.827
0.839
0.746
0.794
0.640
0.653
0.813
0.759
0.766
0.793
0.870
0.743
Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations
0.827
0.912
q22
q23
0.854
0.877
0.683
Meta-Organizational Dimension
0.831
Extra-Organizational Dimension
q18
q19
q20
q21
0.913
0.915
0.912
0.878

Figure 1. Outer Model of Partial Least Squares (Measurement Model)

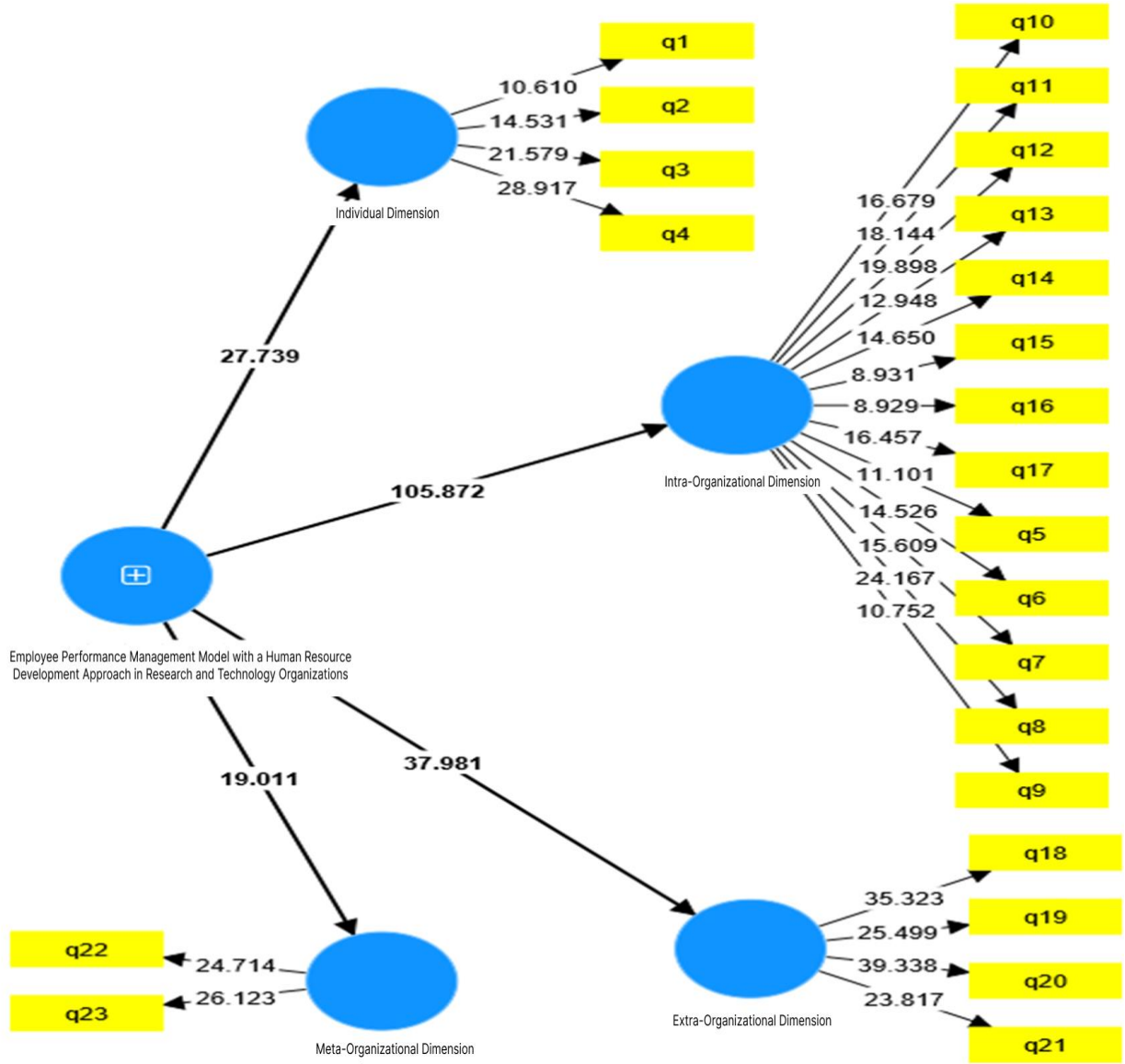


Figure 2. t-Value Statistics of the Research Model Using Bootstrapping Technique

According to the results, all observed factor loadings exceed 0.3, indicating an appropriate correlation between the observed variables and their respective latent variables.

Based on the results, all components and indicators achieved a value greater than 1.96. Consequently, these indicators can be used for component model fitting, confirming that each main variable has been accurately measured. Given these findings, the dimensions and components can be ranked.

Additionally, convergent validity was calculated. The Cronbach's alpha for all variables was greater than 0.7, confirming the reliability of all variables. The average variance extracted (AVE) exceeded 0.5 in all cases, thereby validating convergent validity. Furthermore, the composite reliability (CR) was greater than the AVE, reinforcing the robustness of the measurement.

The R^2 value for the construct was 0.799, which, based on standard criteria, confirms the appropriateness of the structural model fit.

The overall model fit (GOF criterion) was calculated as 0.672, which allows the researcher to verify the overall fit of both the measurement model and the structural model.

In this section, based on factor loadings, the dimensions and components were ranked:

Table 3. Prioritization of Dimensions and Components of Employee Performance Management with a Human Resource Development Approach in Research and Technology Organizations

Overall Rank	Rank in Dimension	Factor Loading	Component	Rank	Factor Loading	Dimension
17	4	0.790	Ability	3	0.868	Individual
14	3	0.799	Performance Evaluation			
8	2	0.857	Professional Ethics			
7	1	0.869	Creativity and Innovation			
11	3	0.834	Role Clarity	1	0.964	Intra-Organizational
12	4	0.827	Motivational Factors			
10	2	0.839	Training			
20	10	0.746	Leadership Style			
15	6	0.794	Work Environment			
23	13	0.640	Reward System			
22	12	0.683	Performance Measurement			
13	5	0.813	Employee Communication			
19	9	0.759	Rules and Regulations			
18	8	0.766	Organizational Climate			
16	7	0.793	Job Program Design			
6	1	0.870	Employee Health and Well-being Factors			
21	11	0.743	Training and Development			
2	2	0.913	Organizational Support	2	0.912	Extra-Organizational
1	1	0.915	Economic Factors			
3	3	0.912	Socio-Cultural Factors			
4	4	0.878	Recruitment			
9	2	0.854	Human Resource Planning	4	0.827	Meta-Organizational
5	1	0.877	Hiring and Selection			

Among the dimensions, the intra-organizational dimension ranks first, followed by the extra-organizational dimension, the individual dimension, and finally, the meta-organizational dimension in order of importance.

Main Research Question: What is the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations?

The employee performance management model with a human resource development approach in research and technology organizations, developed in the present study based on expert opinions, consists of 4 dimensions, 23 components, and 108 indicators. This model was formulated based on semi-structured interviews, theoretical foundations, and thematic analysis.

Based on the findings from questionnaire validity and reliability assessments and literature review results, the model comprises five main sections and a core framework, including:

1. Philosophy and General Objectives of the Model
2. Theoretical Foundations of the Model
3. Implementation Stages of the Model
4. Evaluation System of the Model
5. Execution Mechanism of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations

A researcher-developed questionnaire was designed to assess the model's validity. It included five dimensions (philosophy and objectives, theoretical foundations, evaluation, executive principles, and execution mechanisms), with Likert-scale-based questions. To ensure internal validity, the questionnaire was distributed among 30 experts, and the results indicated that all components scored above 3 on the Likert scale, confirming the acceptance of the model.

For philosophy and objectives, theoretical foundations, executive principles, evaluation system, and execution mechanisms, the t-statistic was significant at the 0.01 level. A comparison of the mean score of the philosophy and objectives section with the population mean demonstrated that these components hold high validity from the perspective of specialists and were confirmed with 99% confidence.

1- Philosophy and General Objectives of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations (3.93)

Providing a coherent and practical model for developing the components of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations.

Establishing a theoretical foundation for introducing the concept of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations.

Institutionalizing the concepts of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations.

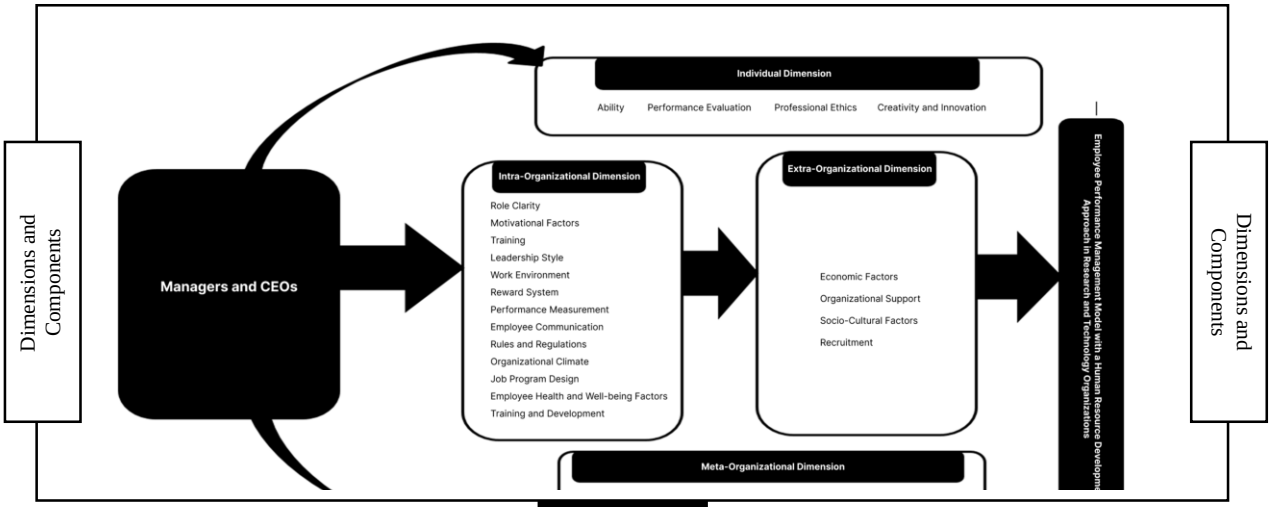
Transmitting and expanding the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations.

Enhancing the quality of managerial activities and services based on the components of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations.

Increasing the influence of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations within the Research Institute of Petroleum Industry.

2- Theoretical Foundations of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations (3.88)

Armstrong & Taylor's Model (2020)- Harvard Model- Warwick Model- Guest Model- Performance Management System- Fombrun Model- Personnel Management Model: Actions, Trends, and Development- 360-Degree Feedback Model- Employee Performance Management and Measurement Model- Human Resource Development Process Model-



3- Principles of Implementing the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations (3.85)

Establishing an Executive Committee for the implementation of the model - Identifying and analyzing strengths, weaknesses, opportunities, and threats related to performance management - Conducting training workshops to create alignment and disseminate strategies related to the Employee Performance Management Model - Planning and executing actions and activities in line with the Employee Performance Management Model with a Human Resource Development Approach - Validating and ensuring the reliability of performance management measures required by managers, deputies, and experts - Defining the desired performance standards for managers, deputies, and experts - Reviewing and determining strategies for model implementation - Evaluating the execution phases of the Employee Performance Management Model - Developing and preparing educational packages to explain the implementation of employee performance management.

4- Execution Mechanism of the Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations (3.79)

Conducting in-service training programs - Introducing the expertise of retired managers and specialists from the Research Institute of Petroleum Industry - Strengthening the Information Technology (IT) sector of the Research Institute of Petroleum Industry - Familiarizing managers and deputies with the concepts of employee performance management - Enhancing organizational infrastructure to support the implementation of the model.

Figure 3. Employee Performance Management Model with a Human Resource Development Approach in Research and Technology Organizations

4. Discussion and Conclusion

Today, human resources are the most valuable asset of organizations, playing a fundamental role in capability building and achieving organizational objectives. With increasing global competition and the complexities of the business environment, organizations must design and implement effective performance management systems that not only fulfill strategic goals but also facilitate human resource development. This necessity is even more critical in research and technology organizations, where the knowledge-based nature of these entities requires specialized mechanisms for performance management that enhance both organizational productivity and individual employee development. Given the specific challenges of these organizations, such as rapid technological changes, intense competition, and the constant need for innovation, designing models that optimize employee performance is of paramount importance.

Research organizations face significant challenges, including the lack of comprehensive performance management models and inefficiencies in human resource development programs. The misalignment of existing models with the specific characteristics of research organizations results in long-term reductions in efficiency and effectiveness. Studies indicate that organizations that have implemented comprehensive and effective performance management systems have significantly improved their productivity and efficiency [12, 13]. The present study seeks to address this gap by proposing a comprehensive model that provides a practical solution for enhancing performance management in research and technology organizations.

The research findings revealed that the proposed model, which identifies five main dimensions and 23 components, offers a comprehensive framework for performance management. Among these, the intra-organizational dimension was found to have the greatest impact on performance improvement. This finding highlights the need for research and technology organizations to focus their efforts on enhancing internal factors such as organizational culture, employee motivation, and supportive structures.

The analysis of semi-structured interviews indicated that the absence of efficient monitoring and feedback systems leads to employee dissatisfaction and reduced commitment. Employees in research organizations, in particular, require constructive feedback and transparent evaluation processes to improve their performance.

Additionally, clear and enforceable rules and regulations were identified as one of the most critical components. This finding underscores the necessity of establishing transparent organizational policies, which serve as the foundation for any successful management model. Employees in research and technology organizations highly value clarity in evaluation processes and constructive feedback mechanisms.

Another significant result was the strong influence of cultural and organizational factors on employee motivation and productivity. Specifically, fostering a supportive organizational culture that promotes continuous learning and innovation was recognized as a key success factor for the model.

The results of the quantitative analysis demonstrated that the use of techniques such as fuzzy DEMATEL and structural equation modeling (SEM) provided greater clarity on the complex relationships between the various dimensions and components of performance management. The fuzzy DEMATEL analysis identified clear and enforceable rules and regulations as the most influential factor, emphasizing the importance of formal frameworks in performance management. The analysis also showed that some components, such as rules and regulations, have a high impact on other dimensions, while others, like individual goals, serve as supporting elements. These findings highlight the necessity of integrating individual and organizational goals.

In this context, the use of precise indicators for performance evaluation and the timely provision of feedback can contribute to continuous employee improvement. Additionally, the evaluation system must possess sufficient flexibility to adapt to environmental changes and employee needs. The results of confirmatory factor analysis further confirmed the structural validity of the proposed model.

The findings of this study align with prior studies [1, 4-6, 8-11, 13-21].

Thus, it is suggested to:

- Develop work programs to empower employees.
- Expand performance management programs within organizations.
- Enhance managerial commitment to employee performance management implementation.
- Provide rewards and incentives to encourage active participation in group decision-making.
- Strengthen internal organizational communication and establish mechanisms for enhanced collaboration and synergy.

- Implement continuous monitoring and evaluation systems for managerial, educational, and performance-related processes as well as human resource development.

The present study represents a significant step toward improving management processes in research organizations and can serve as a model for other knowledge-based and technology-driven industries. Given the complexities and challenges faced by research and technology organizations, the implementation of this model can not only enhance internal productivity but also play a crucial role in achieving the country's broader economic and scientific objectives.

Authors' Contributions

Authors equally contributed to this article.

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Declaration of Interest

The authors report no conflict of interest.

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Ethical Considerations

All procedures performed in this study were under the ethical standards.

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