Structural Model of the Impact of Talent Management on Human Resource Productivity and Innovation in the National Road Maintenance and Transportation Organization

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Abstract

The present study aimed to examine the impact of talent management dimensions on human resource productivity and innovation in the National Road Maintenance and Transportation Organization. This research is a descriptive-survey study with an applied purpose. The statistical population included all employees of the National Road Maintenance and Transportation Organization. Given the limited size of the population, the sample size was considered equal to the statistical population (N = 64). After establishing the validity and reliability of the measurement tools, the standardized Armstrong Talent Management Questionnaire (2006), the Human Resource Productivity Scale, and the Patchen Job Innovation and Creativity Scale (1965) were used for data collection. Data analysis was conducted using descriptive and inferential statistics as well as structural equation modeling (SEM). The research results indicated that talent management and its dimensions significantly influence human resource productivity and innovation in the National Road Maintenance and Transportation Organization. In the total effect analysis, talent management had the highest impact on human resource productivity (β = 0.92). The coefficient of determination (R^2) for the endogenous variables demonstrated that 29% and 91% of the variance in human resource productivity and innovation, respectively, could be explained by the exogenous variables. Based on the findings of this study, proper implementation of talent management and its dimensions can enhance human resource productivity and, consequently, improve innovation within the National Road Maintenance and Transportation Organization. This, in turn, increases the efficiency of talented individuals in the organization.

Keywords: *Talent Management, Productivity, Innovation.*

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1. Introduction

The contemporary world is undergoing rapid transformation. Although change has always been present throughout history, its current pace and depth are unprecedented. Organizations, as one of the most prominent features of modern societies, are also rapidly evolving, with human resources playing an undeniable role in these transformations [1]. In the third millennium, organizations increasingly refer to the concept of human capital. The development of human resources is considered the key to organizational sustainability. Technology is no longer the sole major challenge in the business landscape; rather, leveraging intelligent human resources and talented human capital is the fundamental strategy for addressing business challenges. Human resource development management is not merely a cost center; it aligns with organizational business strategies. Organizations strive to enhance profitability and reduce costs by implementing talent management, fostering workforce diversity, and diversifying training programs to create added value from their human capital [2, 3].

The mission of management and the primary objective of managers in any organization is the efficient and optimal utilization of organizational resources, including workforce, capital, materials, energy, and information. Among these, the effective utilization of human resources, or human resource productivity, holds particular significance. This is because human resources are not only a key organizational asset but also the primary driver for utilizing all other resources. If human resources are productive, they can effectively manage other resources and optimize productivity across various domains, ultimately enhancing organizational efficiency. The question of how to improve human resource productivity has long been a focal point of management and organizational studies [4, 5].

Modern organizations require strategic, creative, innovative, flexible, responsible, and accountable human resources. Given the rapid pace of environmental changes, organizations need individuals who can adapt structures to emerging needs while maintaining self-regulation and self-management. These individuals actively create opportunities, assess their strengths and weaknesses, and transform environmental limitations and threats into opportunities. They go beyond task-based performance, adding value to their work [6]. However, identifying, attracting, and retaining such high-potential individuals has become more challenging than ever before. Dynamic organizations operating in competitive environments actively seek opportunities to recruit top talent. Organizations that fail to align their human resource management strategies with contemporary norms risk obsolescence [6-8].

To drive innovation, organizations may invest in human capital to develop organizational expertise necessary for generating new ideas. These strategic initiatives require employees to be motivated and engaged in improving their performance. Organizations may implement strategic human resource management (HRM) practices that encourage employees to participate in deliberate efforts aimed at enhancing organizational expertise to achieve corporate goals. Consequently, strategic HRM initiatives play a crucial role in facilitating innovation [9-11].

When organizations engage in innovation-related activities, they encounter uncertainty and variability in the innovation process, necessitating creative employees who are flexible, risk-taking, and capable of handling ambiguity and uncertainty. Therefore, organizations should emphasize these attributes in recruitment and selection processes. By prioritizing creative and innovative capabilities in hiring criteria, organizations can foster idea generation and enhance employee commitment to innovation. Effective and efficient recruitment strategies position employees as valuable sources of new ideas within the organization's innovation ecosystem [12-14]. Thus, human resources should be regarded as the most valuable asset of an organization, playing a pivotal role in achieving organizational objectives.

Recent studies indicate that many large organizations face a shortage of talented individuals [15-17]. In modern organizations, talent management is a critical competitive advantage, and identifying top talent has become a core priority in human resource management. Talent management emphasizes that all individuals possess unique talents that should be identified and nurtured. The talent management cycle consists of three main components: identifying and attracting talent, retaining talent, and developing talent. Today, organizations are increasingly focused on hiring talented employees, a trend often referred to as the "war for talent" [18-20].

Talent management is crucial for two main reasons. First, effective talent management facilitates the identification and retention of high-potential individuals. Second, talented employees are essential for filling key strategic roles in the future. Talent management represents a modern approach that can revolutionize human capital management by

addressing shortcomings in traditional HR practices. As such, it should be considered a complementary tool to conventional HRM strategies [21-24]. Talent management serves as a key driver of organizational success [10, 11] because it contributes to high organizational performance, quality improvement, innovation, job satisfaction, and employee productivity [16, 17]. According to Rothwell, talented employees can be up to 20 times more productive than average employees, making investment in talent management highly beneficial for organizations [25-29].

A nation's progress depends not only on its natural resources but also on its intellectual and dynamic human capital. Sustainable growth in any system is only achievable with a skilled, motivated, and healthy workforce (Khaddadadi et al., 2010). In Iran, enhancing productivity has become a necessity rather than an option (Ghabizi, 2013). Talent management should not be limited to HR departments but must be integrated across all organizational levels [1, 3, 7]. While innovativeness has innate and intrinsic characteristics, organizations that support innovative employees and foster participatory management can significantly enhance creative activities and talent development [4, 10]. However, attracting, motivating, and retaining talent remains a significant challenge, often leading to financial and intellectual capital losses for organizations [8, 20].

In today's developed economies, material and natural resources are no longer considered primary success factors. Instead, human capital is recognized as a crucial driver of economic, social, political, artistic, and cultural progress. Effective leadership based on skilled, educated, and competent employees enhances organizational efficiency and productivity. Organizations must leverage intelligent leadership to optimize their existing systems and maximize the potential of their human resources to achieve strategic goals. While numerous studies have examined talent management, innovation, and productivity [5, 6, 12, 15], no comprehensive research has simultaneously investigated these factors within Iran’s National Road Maintenance and Transportation Organization. This study aims to assess the impact of talent management dimensions on human resource productivity and innovation in this organization and propose practical strategies for enhancing workforce productivity and innovation.

2. Methodology

The present study is applied in terms of its objective and descriptive-correlational in terms of its nature and method. To develop the theoretical framework and research model, library studies were utilized. The statistical population of this study comprised all employees of the National Road Maintenance and Transportation Organization, with a total population of 64 individuals. Due to the limited population size, the entire population was considered as the sample (n = 64).

To assess the impact of talent management and innovation on human resource productivity in the National Road Maintenance and Transportation Organization, a questionnaire was used. The questionnaire consisted of four sections with a total of 61 questions. The first section included demographic information such as age, gender, and education level. The second section consisted of the Armstrong Talent Management Questionnaire (2006), which contained 25 questions covering three dimensions of talent management: talent acquisition, talent retention, and talent development. The third section was the Human Resource Productivity Questionnaire, consisting of 26 questions measuring seven dimensions of productivity: ability, understanding, cognition, organizational support, motivation, feedback, validity, and adaptability. Both the talent management and productivity questionnaires were designed using a five-point Likert scale, ranging from 1 (very low) to 5 (very high). The fourth section included the Patchen Job Innovation Questionnaire (1965), composed of six items, designed to evaluate an individual's ability to implement innovation in their job.

To ensure content validity, the questionnaire was reviewed by experts and specialists in the field, and their feedback was incorporated before finalization. Reliability was assessed using Cronbach's alpha, yielding the following values: 0.93 for talent management, 0.92 for human resource productivity, and 0.76 for job innovation, indicating high reliability.

The questionnaire was distributed to all employees, and 61 completed questionnaires were returned correctly. For data analysis, descriptive statistics were used. Inferential statistical analysis involved Cronbach’s alpha, Pearson correlation coefficient, and structural equation modeling (SEM) to determine relationships between variables within the causal model. The analyses were conducted using SPSS and AMOS statistical software.

3. Findings and Results

A key assumption in multivariate statistical methods is the normality of multivariate data. Failure to verify this assumption may lead to incorrect conclusions (Ghasemi, 2010). Therefore, in this study, data normality was examined using skewness and kurtosis for univariate normality, and Mardia's coefficient for multivariate normality. The hypothesis of non-normality of the multivariate distribution was rejected. Additionally, results from tolerance statistics and the variance inflation factor (VIF) indicated that there was no issue of multicollinearity among independent variables.

An analysis of demographic characteristics of employees in the National Road Maintenance and Transportation Organization revealed the following distributions. The largest proportion (52.5%) of participants fell within the 31-40 age group. Seventy-seven percent were male, while 23% were female. Forty-one percent had between 11 to 20 years of experience. Forty-nine percent held a bachelor's degree, while 34.4% held a master's degree or higher.

As presented in Table 1, among the talent management variables, talent acquisition and talent development had the highest mean scores. Similarly, among human resource productivity variables, feedback, understanding, and adaptability had the highest mean scores. These findings indicate that organizational managers primarily focus on acquiring and developing talented individuals, leading to enhanced productivity and innovation.

Since path analysis models rely on correlation matrices, the correlation matrix among research variables is presented in Table 1. Pearson's correlation coefficient results indicated a positive and significant relationship between innovation, productivity, and talent management. Additionally, positive and moderate correlations were observed among talent management, productivity, and innovation. A positive and significant relationship was also found between dimensions of productivity and innovation.

Table 1. Correlation Matrix of Research Variables

Variables	1	2	3	4	5	6	7	8	9	10	11	12
1) Talent Management	1											
2) Productivity	0.91	1										
3) Innovation	0.29	---	1									
4) Adaptability	---	0.07	---	1								
5) Validity	---	0.89	---	0.17	1							
6) Feedback	---	0.86	---	0.18	0.61	1						
7) Motivation	---	0.79	---	0.32	0.71	0.68	1					
8) Support	---	0.79	---	0.05	0.71	0.68	0.63	1				
9) Understanding	---	0.75	---	0.05	0.67	0.64	0.73	0.59	1			
10) Talent Acquisition	0.83	---	---	---	---	---	---	---	0.56	1		
11) Talent Retention	0.84	---	---	---	---	---	---	---	0.57	0.69	1	
12) Talent Development	0.89	---	---	---	---	---	---	---	0.61	0.74	0.75	1
Mean	3.03	3.11	3.25	3.22	3.02	3.27	2.68	3.00	3.25	3.14	2.92	3.00
Standard Deviation	0.61	0.54	0.62	0.77	0.77	0.63	0.76	0.74	0.58	0.54	0.81	0.74
Skewness	0.33	0.32	-0.13	-0.30	0.21	-0.05	-0.07	0.36	-0.08	-0.01	0.12	0.58
Kurtosis	0.67	-0.13	-0.19	0.73	-0.06	0.13	-0.52	0.10	-0.25	0.56	-0.38	0.59
Range	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)	(1-5)

To examine direct, indirect, and total effects of factors influencing productivity and innovation in organizations, structural equation modeling (SEM) was used. In this model, talent management was considered an exogenous variable, while productivity and innovation factors were considered endogenous variables.

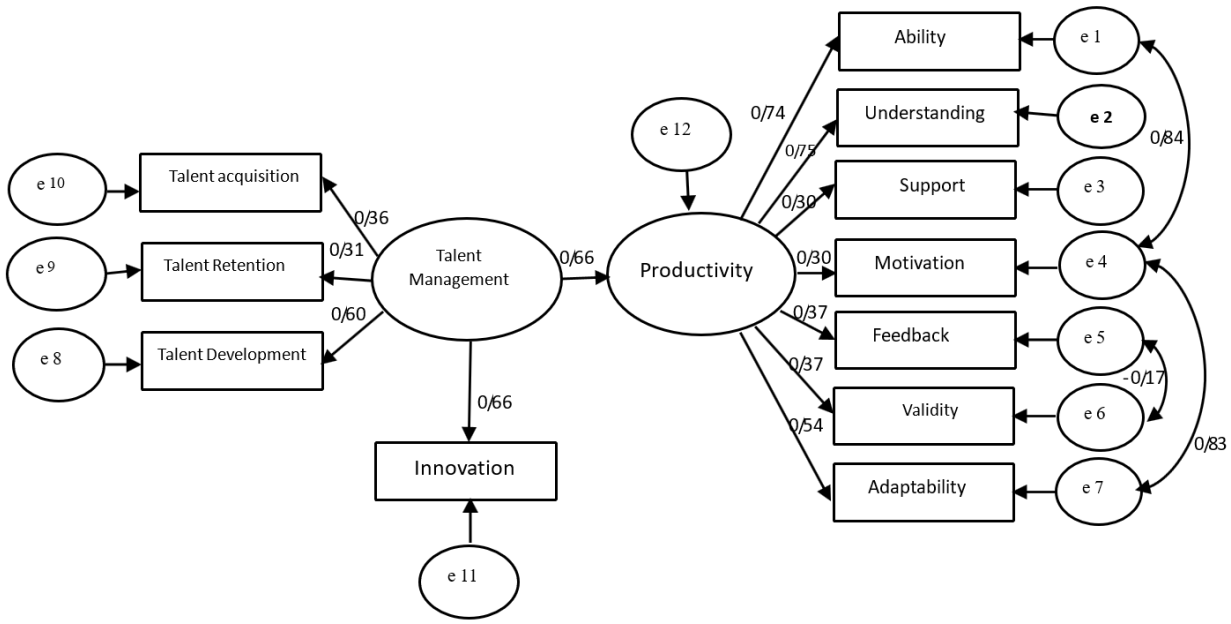

Figure 1. Direct and Indirect Influence-Dependency Analysis of Variables

Due to the lack of universal agreement among experts on the best model fit indices in SEM, Kline and Thompson (2004) recommend reporting CMIN (χ^2 in AMOS), NFI, CFI, and RMSEA (Pashasharifi et al., 2012). Accordingly, in this study, the Chi-square relative index (CMIN/DF) and root mean square error of approximation (RMSEA) were used as absolute fit indices, while the comparative fit index (CFI) and normed fit index (NFI) were used as comparative fit indices. The statistical fit indices indicate that CFI and NFI values greater than 0.90, RMSEA less than 0.05, and CMIN/DF below 3 suggest a well-fitted model.

Table 2. Model Fit Indices

P Value	RMSEA	CMIN/DF	NFI	CFI
0.66	0.08	5.56	0.63	0.66

According to the results, talent management had a direct and positive effect on productivity (β = 0.92), meaning that for each unit increase in talent management, productivity increased by 0.92.

The results also indicated that among talent management dimensions, talent development (β = 0.89), talent retention (β = 0.84), and talent acquisition (β = 0.82) had the highest direct and positive impact on talent management. Among productivity factors, validity (β = 0.89), feedback (β = 0.85), motivation and support (both β = 0.79), understanding (β = 0.74), and adaptability (β = 0.07) had the highest direct and positive impact on productivity.

The effect of talent management on innovation was β = 0.29, indicating a positive and direct impact on innovation.

Finally, the total effect analysis showed that talent management had the highest impact on productivity (β = 0.91), while adaptability had the lowest impact (β = 0.07). The model also indicated that 85% of the variance in productivity was explained by its predictor variables.

4. Discussion and Conclusion

Talent is considered a vital necessity for organizations [3, 12]. In today's competitive environment, successful organizations recognize that achieving a significant competitive advantage and ensuring survival in complex economic conditions requires acquiring the best talents. Organizations not only understand the importance of attracting, developing, and retaining talent but also recognize that talented individuals serve as one of the most critical resources for achieving optimal outcomes. As a result, investing in talent management yields high returns on investment while also fostering a diverse talent pool within the organization. In such circumstances, the organization benefits from an agile and motivated workforce [1, 5, 13].

The present study aimed to examine the impact of talent management on productivity and innovation within the organization, with participation from all employees of the National Road Maintenance and Transportation Organization. The findings indicate that talent management and its dimensions (talent acquisition, talent retention, and talent development) significantly influence human resource productivity. These results suggest that talent management strategies, including attracting, retaining, and nurturing talent, enhance organizational outcomes and increase employee productivity. This finding aligns with previous research [5, 6, 12, 15, 23]. Improving productivity in an organization requires multiple conditions, the most crucial of which is human capital, as it is one of the most valuable resources in any organization. Therefore, managers can enhance human resource productivity by recruiting competent and capable employees.

Among the dimensions of talent management, the most influential factors in enhancing productivity are talent development (factor loading = 0.90), talent retention (factor loading = 0.85), and talent acquisition (factor loading = 0.82). These findings are consistent with the prior research [5, 12, 15, 23]. In talent management development, managers should not only focus on external recruitment but also recognize and utilize internal talent. Experienced employees should be leveraged for mentoring less-experienced employees, training newcomers, and contributing to the selection of new hires. This approach enhances motivation and organizational belonging among existing talent, reduces costs associated with recruitment and training, and prevents the loss of key personnel who are critical to the organization's success. Additionally, involving employees in decision-making processes fosters commitment, ultimately increasing organizational efficiency and productivity.

Talent management significantly impacts organizational productivity, with a factor loading of 0.92. This finding suggests that effective utilization of human resources, proper workforce planning, and efficient recruitment processes are essential for ensuring an adequate supply of skilled professionals. Additionally, performance evaluations, competency-based assessments, and talent retention strategies contribute to increased organizational productivity. Talent acquisition includes workforce planning, recruitment, selection of specialized personnel, and structured assessment center evaluations and interviews. Organizations that hire highly talented and skilled employees experience greater productivity because these individuals perform the work of multiple employees while reducing costs and improving efficiency, sometimes increasing productivity by up to 20 times [3, 4].

Different strategies exist for retaining top talent, but they must be based on an accurate understanding of the factors that influence employee motivation. Identifying key motivators for employees and aligning rewards accordingly enhances job satisfaction and organizational loyalty. Competency-based assessments should guide compensation and recognition programs. Regular performance evaluations should provide timely feedback and constructive guidance to employees. Organizations must also foster trust and timely recognition—whether financial or non-financial—to maintain employee engagement and prevent talent attrition. Creating a work environment that supports professional growth, collaboration, and creativity is essential for talent retention. Since talent development is a core principle of talent management, prioritizing this aspect leads to talent growth, profitability, and increased organizational productivity. Professional training programs, timely supervision, participation in seminars, and collaborative knowledge-sharing initiatives help enhance employee performance. Engaging talented employees in decision-making processes and fostering trust between management and talent pools further accelerates their growth and development.

Another key finding of this study is that talent management also influences innovation. Organizations that attract creative and talented individuals foster a culture of continuous innovation and differentiation from competitors. These findings align with the prior studies [5, 6, 12, 15]. While acquiring talented human capital is essential for organizational success, it is not sufficient on its own. Organizations also require effective strategies and innovative approaches to fully leverage talent resources [14-16]. Consequently, each organization must assess its current talent management processes, identify strengths and weaknesses, and optimize talent management systems to maximize its workforce potential [9, 21, 22].

To enhance innovation, managers should recruit creative employees who are adaptable, risk-tolerant, and capable of managing uncertainty and ambiguity. When organizations prioritize creative and innovative capabilities in their recruitment and selection processes, employees are more likely to generate diverse ideas and drive innovation. Talent management strategies, structured recruitment programs, and initiatives for employee development and recognition create an environment that fosters creativity and innovation.

Given the positive and direct relationship between talent management components and human resource productivity, organizations should optimize talent acquisition and workforce planning based on individual competencies. In other words, organizations should assign roles based on employees' capabilities and qualifications to enhance productivity. Additional strategies for talent acquisition, retention, and development that contribute to productivity growth include addressing essential employee needs, involving employees in decision-making, fostering a participatory leadership style, encouraging teamwork, providing competitive benefits, and implementing effective performance evaluation systems.

Since employee development enhances talent, capacity, and skills, helping employees understand and maximize their potential enables them to adapt better to organizational changes and improve performance. Organizations should supplement specialized training programs with workshops focused on mental and physical well-being and effective communication. Moreover, involving employees in decision-making processes fosters a sense of commitment, which in turn enhances organizational efficiency and productivity.

Assessing employee performance outcomes helps individuals identify their strengths and areas for improvement. Increased self-awareness contributes to higher-quality work. Organizations should provide honest performance feedback and constructive guidance to employees, enabling them to develop professionally and enhance their emotional resilience.

Innovation is an essential aspect of organizations and must be continuously reinforced. Given the positive and direct relationship between talent management components and innovation, organizations must embed innovation into their culture and operations. Establishing research and innovation units can facilitate and accelerate creative initiatives. Organizations should leverage brainstorming techniques, nominal group methods, problem-solving approaches, and biomimicry to create an environment conducive to innovation.

The findings of this study confirm that talent management significantly influences both human resource productivity and innovation. Since this research focused on a limited scope of talent management effects, further studies could explore similar cases in different regions while considering cultural and social limitations to compare results. Future research could also examine the impact of talent management on entrepreneurship, organizational performance, job satisfaction, and organizational commitment.

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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