

Impact of Artificial Intelligence and Human Resource Management on Leadership Organization Performance

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ABSTRACT

This research was conducted in the manufacturing company sector in Batam. It aims to find out how much influence artificial intelligence and human resources have on leadership's influence on organizational performance. The method used in this research is quantitative. The sample required for this research is 173 respondents. This research results in the data being free from standard method bias because the VIF value is below 5.00. In the convergent validity test, the outer loading values of all variables and indicators reach 0.5, confirming that all variables meet the validity criteria. In the Fornell Larcker validity test, the variable average is valid because there are variables less than 0.6, namely organizational performance. All variables are considered reliable in the reliability test except LEP because the average Cronbach's alpha value is not more than 0.6 and meets the established criteria. Suggestions for further research may concentrate on other industries, particularly the manufacturing sector, exploring different variables.

INTRODUCTION

Artificial Intelligence (AI) refers to developing computers or computing systems that can perform tasks typically requiring human intelligence. These include understanding human language, decision-making, pattern recognition, and learning from experience. In today's technological era, AI is already capable of performing human tasks, often even more effectively than humans, and has the potential to revolutionize how organizations operate in the digital age. Its impact is evident across various business functions, including Human Resource Management (HRM). The HRM department is responsible for recruiting, training, and retaining employees, managing salaries and benefits, and other tasks. By leveraging AI technology, organizations can streamline HRM processes, enhance decision-making capabilities, and create more effective and efficient HRM operations.

These "intelligent" entities have transformed traditional human resource functions, enhancing HRM's power and potential while presenting significant challenges, such as financial concerns related to specific jobs. Meanwhile, deep learning algorithms, smart devices, and other Internet of Things (IoT) technologies are highly beneficial for conducting business internationally, as they facilitate more efficient coordination and collaboration. Similarly, the adoption of electronic human resource information systems and other emerging technologies provides opportunities to enhance and lower the costs of HRM functions, such as applicant evaluation and employee performance assessment [1].

One of the factors to measure the success of information technology applications is human resources because acceptance of system users can affect the achievement or

disappointment of the application system. Behavioral aspects are human resource factors that can decide the approval or rejection of information technology applications. Previous studies have shown that the effect of successful technology implementation is more on its behavioral aspects. Several factors, both internal and external factors, cause the failure to apply information technology systems in organizations [2].

Human resource management (HRM) involves various tasks, including HR planning, managing human resources, strategic recruitment, employee training, compensation management, development, efficiency, worker relations, health services, employee satisfaction, and providing employee services. It encompasses the policies and practices that boost organizational efficiency, employee engagement, and work quality. Effective HRM practices can significantly improve company performance, impacting revenue, benefits, competitiveness, and market share. Human resources refer to the employees directly controlled by the company, and managing them involves optimizing their performance to meet the organization's strategic objectives [3].

Human Resource Management primarily focuses on enhancing organizational performance by positioning HRM as a solution to business challenges. It is considered a strategic asset contributing to a company's competitive advantage. However, it is argued that if HRM does not evolve to manage its function strategically, top management may continue to view it as a financial burden. In the context of the digital age, HRM is becoming more diverse and people-oriented, with a responsibility to design engaging and challenging roles to retain younger employees. Digital transformation challenges traditional HR practices and calls into question how HR functions are conducted within organizations [4].

Employee efficiency and growth will likely improve when individuals hold significant HR management roles within the company and when an HR framework that positively affects all related functions is established. Companies also enhance their reputation in the community by implementing HR practices that integrate these elements. Effective human resource management is crucial for overall company performance, as employee efficiency influences workplace practices and supports various departments, including governmental ones. Additionally, it's essential to consider variables such as employee retention, job security, current administration, job readiness, and work quality to evaluate overall performance. Moreover, effective HR management, along with training and compensation, plays a key role in optimizing an organization's human resources [5].

Educational leadership involves guiding others within academic settings to achieve specific goals requiring action. This influence can stem from formal authority, such as hierarchical positions, or from other sources of power. When individuals responsible for an educational system take action, their actions impact others, making these actions a form of leadership. While educational leadership ideally involves a sense of responsibility for the educational system being influenced, in practice, it does not always include this responsibility [6].

Leaders must adopt an effective leadership style that involves serving, sharing, and empowering their employees. The success of this leadership style in the digital era is reflected in the credibility, competence, communication, coordination, and participation of employees. At the same time, HR managers must employ the right approach to ensure high employee performance by adopting dialogue-based and transparent HR practices (HRMPs). In the HR domain, AI should be used as an aggregation tool to help managers understand the organization better, streamline processes, and gain deeper insights into job profiles and employee characteristics, thus facilitating broader organizational development [7].

While Industry 5.0 describes advanced automation and technology-driven efficiency, Industry 4.0 focuses on more fully integrating human workers into manufacturing processes. It emphasizes leveraging their creativity, intuition, and problem-solving abilities to enhance productivity and quality. In Industry 5.0, machines and humans are viewed as complementary rather than separate. Technologies such as collaborative robots, augmented reality, virtual

reality, and real-time monitoring systems support workers in expressing and developing their ideas while machines manage repetitive and physically demanding tasks. The emphasis on creativity in Industry 5.0 is significant, as this era strives to incorporate human creativity more deeply into manufacturing processes. This integration aims to generate innovative ideas and designs that boost productivity and quality. By enhancing human-machine collaboration, fostering design thinking, and using data analysis for product customization, Industry 5.0 aims to create a more flexible, innovative, and responsive manufacturing environment, leading to higher-quality products and more fulfilling jobs [8].

The relationship between Artificial Intelligence and Leadership

The field of AI research and the term itself lack a consistent definition. This is because AI integrates engineering and cognitive science elements, leading to its broad range of applications. The specific scientific disciplines needed can vary depending on the application; for example, speech recognition systems require substantial knowledge from neuroscience. Generally, AI is considered a distinct area within computer science research, making precise classification important. AI can be categorized into various levels of development based on its application and complexity. While leadership, crisis management, and uncertainty are well-explored topics, guiding an organization through technological transformation remains a relatively underexplored area. The goal of this leadership is to guide the company deftly through difficult times and lead it successfully toward stability after the revolution [9].

The relationship between Human Resource Management (HRM) and Leadership

Human Resource management and strategic leadership development are crucial across all sectors, focusing on designing effective recruitment practices, employee retention, professional development, and strategic planning. As organizations increasingly view human resources as a competitive advantage, transformational leadership management becomes a key tool for enhancing corporate performance. In the modern economy, Human Resources (HR) is evolving from a support role to a strategic business partner. This paper examines the interaction between transformational leadership and strategic Human Resource Management (HRM) practices, exploring how they collectively improve organizational performance. It looks at how transformational leadership influences corporate success, both directly and through strategic HRM practices. Traditional management relies on rules, regulations, and control of inputs and outputs, while the new paradigm emphasizes shared leadership and vision [10].

Relationship between Leadership and Organization Performance

Leadership and cultural organizations have garnered significant attention over the past two decades due to their close relationship with performance management. Historically, the focus was on financial performance, but non-profit metrics such as quality and customer satisfaction are increasingly used to assess organizational success. For organizations aiming to enhance their performance, examining and adapting their leadership style to meet new demands is crucial. Kelman's typology (1958), which explores social influence through processes like personal identification and internalization, provides a theoretical basis for understanding the positive impact of transformational leadership on task performance. When followers exhibit strong positive attributes, such as the ability to articulate a vision, personal identification with transformational leaders is likely to occur [11].

The relationship between Artificial Intelligence and Organization Performance

Artificial Intelligence (AI) refers to a collection of information communication technologies (ICTs) designed to emulate human intelligence, aiming to enhance job performance, boost efficiency, and stimulate economic growth. Knowledge is crucial for AI innovation, as it helps to strengthen the value of intelligent agents and systems. AI-generated agents possess the knowledge needed to improve productivity and develop new insights into business processes.

For instance, an AI-driven strategy involves utilizing technology platforms to make valuable information accessible to employees. Furthermore, AI contributes to organizational innovation by facilitating strategic knowledge management activities [12]. Historically, performance management research has predominantly addressed performance from an operational and financial standpoint, emphasizing its direct effects on organizational competitiveness and strategy. The operational perspective centers on factors critical to the organization's success, such as cost management, process efficiency, and overall quality control, all contributing to a sustainable competitive edge. In contrast, the financial perspective focuses on assessing the organization's assets and liabilities and how revenue generation impacts financial statements. Technology is crucial in enhancing operational performance (OP) and helping organizations achieve operational excellence, financial goals, and customer satisfaction [13].

Relationship between Human Resource Management and Organizational Performance

Human resource decisions impact organizational performance by enhancing efficiency or contributing to revenue growth. Traditionally, human resources have been viewed primarily as a cost to minimize, but they also offer improvement opportunities. Recent literature on the relationship between human resource management and performance has explored various aspects, such as Green HRM practices, collective commitment to environmental management, and organizational citizenship behavior towards the environment. Studies have examined how green training, employee involvement, and performance management influence organizational behavior in the healthcare and hospitality industries [14].

The relationship between Artificial Intelligence and Organizational Performance mediated by Leadership

Leadership is a key mediator that positively impacts the relationship between Artificial Intelligence (AI) and organizational performance. Studies indicate that AI significantly enhances organizational performance. Organizational resilience, defined as an organization's capacity to adapt, recognize, and respond to external challenges and changes, is crucial. Effective leadership and a strong organizational culture mediate the positive connection between organizational resilience and performance [15].

The relationship between Human Resource Management and Organization Performance mediated by Leadership

Leadership is a key mediator that positively impacts the relationship between Human Resource Management (HRM) and organizational performance. A human resource management strategy encompasses various personnel management approaches within an organization. Transactional Leadership differs from transformational Leadership in that it focuses on mutual exchanges between leaders and subordinates, where both parties' contributions are acknowledged. In this approach, leaders clearly define goals and strategies for their subordinates, emphasizing task completion over innovation and creativity. Employee engagement provides a competitive advantage for organizations. Employee commitment is a key indicator of performance, and leaders should pay attention to enhancing this commitment through reciprocal engagement [16].

METHOD

This study aimed to examine how exogenous latent variables influence their respective endogenous latent variables and the dynamics of these relationships. It employed a descriptive and quantitative research approach to collect and analyze data systematically using statistical tests. The deductive method was applied to investigate established theories across diverse industries. Utilizing a correlational quantitative approach, the study tested hypotheses and explored the relationships between the variables under scrutiny. Primary data were gathered through the distribution of online questionnaires. The research focused on manufacturing

companies in Batam as its target population. The required sample size was 170 respondents, selected using non-probability purposive sampling techniques. Generally, a sample size ranging from 100 to 200 respondents is recommended for such studies, and thus, the sample of 170 respondents from Batam's manufacturing sector meets these criteria effectively.

CONCEPTUAL FRAMEWORK

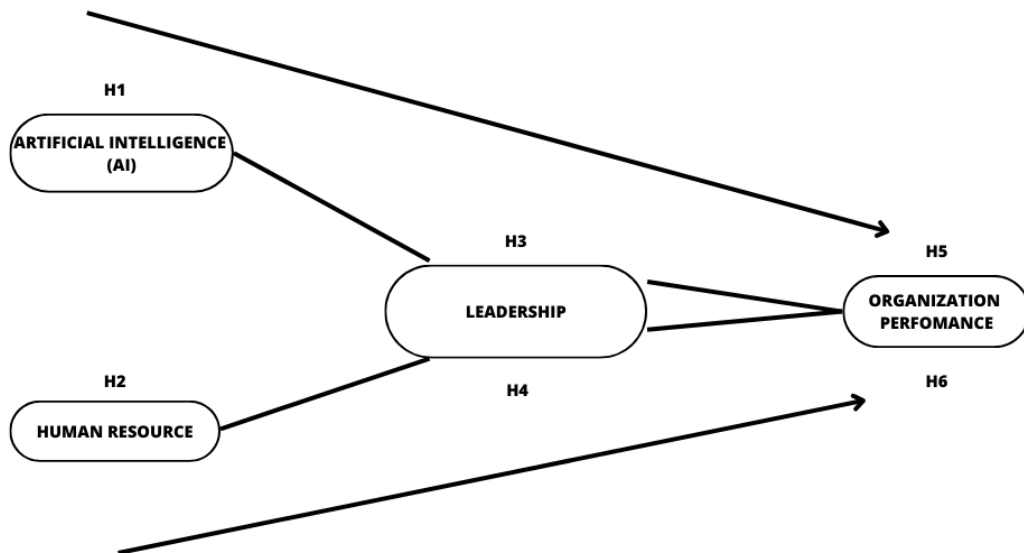


Figure 1. Concept Framework

RESULT AND DISCUSSION

Table 1. Common Method Variance Test

	AI	HRM	LEP	OP
AI			1.13	1.16
HRM			1.13	1.33
LEP				1.30
OP				

Source: Research Analysis, 2024

The purpose of the CMV Test (Normal Technique Change) is to help ensure the integrity of information by identifying the potential components of the analysis caused by the measurement method used. It helps ensure that the data analyzed is reliable and substantial. Based on the test results in the table above, the data output value of the percent of Variance is 28.039%. Thus, the result of this CMV study can be concluded that the data is free of standard method bias because the data percent of Variance does not exceed 50% (<50%).

Table 2. Outer Loading Test

	AI	HRM	LEP	OP
AI 3	0.755			
AI 4	0.718			
AI 6	0.777			
HRM 1		0.693		
HRM 3		0.800		
HRM 4		0.833		

LEP 1	0.763	
LEP 5	0.760	
OP 1		0.819
OP 3		0.769
OP 5		0.648

Source: Research Analysis, 2024

According to the outer loading results, all indicators for Artificial Intelligence, Human Resource, Leadership, and Organizational Performance are considered valid, as their outer loading values have exceeded 0.7.

Table 3. Test Average Variance Extracted

Average Variance Extracted (AVE)	
AI	0.563
HRM	0.605
LEP	0.580
OP	0.561

Source: Research Analysis, 2024

Average Variance Extracted (AVE) represents the average squared loadings of all indicators linked to a construct. According to the AVE, the value should be above 0.50. Based on the AVE test results, all indicators for Artificial Intelligence, Human Resource, Leadership, and Organizational Performance are deemed valid, as their values exceed 0.5.

Table 4. Fornell – Lacker Criteria

	AI	HRM	LEP	OP
AI	0.751			
HRM	0.335	0.778		
LEP	0.303	0.456	0.761	
OP	0.364	0.238	0.264	0.749

Source: Research Analysis, 2024

According to the Fornell and Larcker criteria, the square root of the AVE of a construct should be greater than its correlation with any other construct in the model (Fornell & Larcker, 2012). Based on the Fornell-Larcker test results, no correlation value exceeds the correlation between the indicators. Therefore, it can be concluded that the Fornell-Larcker test results are valid, and Discriminant Validity is achieved.

Table 5. Cross loadings

	AI	HRM	LEP	OP
AI 3	0.755	0.221	0.225	0.250
AI 4	0.718	0.293	0.202	0.277
AI 6	0.777	0.242	0.253	0.291
HRM 1	0.181	0.693	0.224	0.076
HRM 3	0.223	0.800	0.362	0.153
HRM 4	0.339	0.833	0.425	0.269
LEP 1	0.196	0.384	0.763	0.170
LEP 5	0.266	0.310	0.760	0.232
OP 1	0.343	0.262	0.257	0.819
OP 3	0.285	0.109	0.145	0.769
OP 5	0.129	0.124	0.173	0.648

Source: Research Analysis, 2024

Indicator reliability should be greater than 0.70. The recommended loading is 0.708 or higher, though loadings of 0.7, 0.6, 0.5, or 0.4 are also acceptable. According to the test results, each indicator has surpassed the validity threshold of > 0.6.

Table 6. HTMT Value

	AI	HRM	LEP	OP
AI				
HRM	0.484			
LEP	0.736	0.982		
OP	0.529	0.293	0.603	

Source: Research Analysis, 2024

The HTMT criterion is $HTMT < 0.9$. Based on the table above, the HTMT Ratio results are considered valid and meet the requirements for discriminant validity, as all values are less than 0.9.

Table 7. Hypotesis Testing

	Original Sample (O)	Standard Deviation (STDEV)	T-Statistics ((O/STDEV))	P-Values
AI -> LEP	0.169	0.092	1.838	0.066
AI-> OP	0.296	0.096	3.086	0.002
HRM -> LEP	0.399	0.081	4.916	0.000
HRM -> OP	0.075	0.093	0.802	0.423
LEP -> OP	0.140	0.091	1.534	0.125

Source: Research Analysis, 2024

H1. Effect of Artificial Intelligence on Leadership

The analysis results indicate that Artificial Intelligence does not positively and significantly influence Leadership, as the t-statistic is not greater than 1.96 and the p-value is not less than 0.05. Therefore, hypothesis 1, which proposes that Artificial Intelligence significantly impacts Leadership, is not supported.

H2. Effect of Artificial Intelligence on Organizational Performance

The analysis results show that Artificial Intelligence positively and significantly influences Organizational Performance, as the t-statistic is greater than 1.96 and the p-value is less than 0.05. Therefore, Hypothesis 2 suggests that Artificial Intelligence significantly impacts Organizational Performance.

H3. Effect of Human Resources on Leadership

The analysis results indicate that Human Resources positively and significantly influence leadership, with a t-statistic greater than 1.96 and a p-value less than 0.05. Therefore, Hypothesis 3 suggests that Human Resources significantly impact leadership.

H4. Effect of Human Resources on Organizational Performance

The analysis results indicate that human resources does not positively and significantly impact organizational performance, with a t-statistic greater than 1.96 and a p-value less than 0.05. Therefore, Hypothesis 3 suggests that Human Resources significantly impact organizational performance.

H5. Effect of Leadership on Organizational Performance

According to the analysis results, there is no evidence of a positive and significant influence of leadership on organizational performance, as indicated by a t-statistic that is not greater than 1.96 and a p-value that is not less than 0.05. Therefore, Hypothesis 5 suggests that leadership does not significantly impact Organizational Performance.

Table 8. Specific Indirect Effects

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T-Statistics (O/STDEV)	P-Values
AI -> LEP -> OP	0.02	0.02	0.02	1.12	0.26
HRM -> LEP -> OP	0.06	0.06	0.04	1.37	0.17

Source: Research Analysis, 2024

H6. Effect of Artificial Intelligence on Leadership Through Organizational Performance

According to the findings of the analysis, artificial intelligence does not positively and significantly impact leadership through its effects on organizational performance, as evidenced by a t-statistic exceeding 1.96 and a p-value below 0.05. Therefore, Hypothesis 6 proposes that Artificial Intelligence does not significantly influence leadership because it doesn't affect Organizational Performance.

Table 9. Cronbach's Alpha

	Cronbach's Alpha	Composite Reliability
AI	0.613	0.795
HRM	0.692	0.820
LEP	0.275	0.734
OP	0.635	0.791

Source: Research Analysis, 2024

Composite Reliability (CR) is evaluated using Cronbach's alpha as a measure of internal consistency, where 0.7 is typically considered acceptable. In exploratory studies, CR values above 0.70 are preferred, though values between 0.60 and 0.70 are also deemed acceptable. Based on the table provided, it is noted that the entire set of indicators is considered reliable because Cronbach's Alpha exceeds 0.6. Therefore, it can be concluded that all variables are reliable according to Composite Reliability criteria, as they meet or exceed the threshold of 0.6.

CONCLUSION AND RECOMENDATION

From the analysis and discussion that has been submitted, the conclusion is that the majority of respondents in this study are men aged 18-25 years, have a background of high school/SMK education, work as a staff, with a monthly income of around Rp4.500.000 - Rp5.500.000. Although the Common Method Variance test shows data free from the bias of the standard method, there is a need to improve the validity of the leadership and artificial intelligence variables. Moreover, the reliability of the human resources, leadership, and artificially intelligent variables must be improved. Nevertheless, the organization performance variable proved reliable. The Fornell-Lacker test showed the discriminatory validity of all variables. Overall, this study provides an overview of respondent characteristics and data quality. Still, there is room for improving the validity and reliability of the data by improving the variables concerned. Future research may concentrate on other industries, particularly the manufacturing sector, exploring different variables.

Recommendations for Improvement:

1. Validity Enhancements

- Redesign survey items for leadership and AI variables to ensure they comprehensively capture the constructs. This might include using validated frameworks or adding more context-specific examples to align with the respondents' experiences.
- Pilot test revised instruments on a diverse group to ensure clarity and relevance of questions.

2. Reliability Improvements

- Increase the number of items per variable to better gauge consistency. For instance, include multiple dimensions of leadership (e.g., transformational, transactional) and AI (e.g., automation, decision-support).
 - Conduct iterative reliability testing to identify and eliminate weak items.
3. Broaden Respondent Profiles
Future studies should target a more diverse sample, encompassing varied roles (e.g., managers, technical staff), educational levels, and industries. This ensures a richer dataset and enhances the generalizability of findings.
4. Training and Awareness
Since the understanding of leadership and AI may vary, consider providing brief explanations or examples within the survey to align respondents' interpretations of these variables.

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