E ISSN: (2776-7345)
P ISSN: (2776-7353)

Bina Bangsa International Journal of Business and Management (BBIJBM)
Vol. 5 No. 2, page 529-541, August 2025

THE EFFECT OF AI INTEGRATION IN HR PRACTICES ON EMPLOYEE PERFORMANCE: MEDIATING ROLES OF ENGAGEMENT AND PERCEIVED JOB SECURITY

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Article History
Received: June 22, 2025 Revised: July 30, 2025 Accepted: August 30, 2025

Abstract

This study examines the effect of Artificial Intelligence (AI) implementation in Human Resource Management (HRM) on employee performance, with employee engagement and perceived job security as mediating variables. This research was conducted in a biopharmaceutical company in Jakarta with 100 respondents. The method used for data collection is a survey with data collection techniques through online questionnaires. The data processing technique used is Structural Equation Modeling (SEM) with Partial Least Squares (PLS). The results showed that the application of AI in HR has a significant influence on employee engagement, perceived job security, and employee performance. In addition, perceived job security was found to mediate the relationship between AI implementation and employee performance, while employee engagement did not play a mediating role on employee performance. The practical implications of this study provide a reference for HR managers and policy makers to effectively implement AI technologies, support innovation, and maintain employee well-being.

Keywords: Artificial Intelligence, Human Resource Management, Employee Performance, Employee Engagement, Perceived Job Security

DOI:
10.46306/bbijbm.v5i2.161

Homepage:
http://bbijbm.lppmbinabangsa.ac.id/index.php/home

I. Introduction

The rapid development of artificial intelligence (AI) has brought significant transformations across various industrial sectors, including the pharmaceutical and biopharmaceutical industries, which now leverage AI to accelerate innovation, enhance efficiency, and support data-driven decision-making (Davenport et al., 2020). In the context of pharmaceuticals and biopharmaceuticals, AI technologies, such as machine learning algorithms and predictive

analytics, have revolutionized drug discovery processes, supply chain optimization, and personalized medicine, thereby improving productivity and global market competitiveness (Santhosh et al., 2023). For instance, AI is utilized to expedite the development of new drug compounds through molecular simulations and clinical data analysis, enabling pharmaceutical companies to reduce research time and costs (Paul et al., 2021). However, the adoption of AI in this industry also raises concerns about job security, as automation may replace routine tasks such as laboratory data analysis or inventory management, leading to skepticism among employees (Ajithkumar et al., 2023).

Research findings indicate that AI can enhance employee engagement in the pharmaceutical industry when used to enrich job roles, such as assisting researchers in analyzing complex data or supporting marketing teams in developing patient data-driven strategies (Fatima et al., 2024). Conversely, negative perceptions of AI, such as fears of job loss in pharmaceutical manufacturing or administrative roles, can reduce employee motivation and engagement, ultimately adversely affecting organizational performance (Ali et al., 2024).

The application of AI in human resource (HR) processes within the pharmaceutical industry, such as algorithm-based recruitment or employee training using AI simulations, can reduce workloads and improve overall organizational performance (Malik, 2024; Prentice et al., 2023). Employees' innovative behaviors, such as developing new methods for clinical testing or optimizing production processes, can mediate the relationship between AI adoption and job performance (Ghorbanzadeh et al., 2024). However, AI implementation may also trigger job insecurity, particularly among workers involved in easily automatable tasks, such as quality control or clinical trial data processing (Koo et al., 2020). In this regard, change leadership plays a crucial role in mediating the impact of AI on employee performance and engagement in the pharmaceutical industry by ensuring a smooth transition to a technology-driven work environment (Wijayati et al., 2022). While AI can enhance work commitment through tools like AI-based knowledge management systems, concerns about potential unemployment persist, particularly in pharmaceutical production and logistics segments (Luhana et al., 2023). Therefore, pharmaceutical and biopharmaceutical organizations are encouraged to prioritize AI-based training programs that empower employees, such as data scientists or production technicians, to use AI tools efficiently, thereby enhancing performance and job security (Ghorbanzadeh et al., 2024).

This study aims to examine the impact of artificial intelligence (AI) on employee performance in the pharmaceutical and biopharmaceutical industries, with a specific focus on the mediating roles of employee engagement and job security perceptions. The research is expected to provide valuable insights for managers and policymakers in the pharmaceutical sector to implement AI technology effectively, thereby supporting innovation and achieving organizational goals while maintaining employee well-being.

II. Literature Review

2.1. Artificial Intelligence (AI)

Artificial Intelligence (AI) is defined as technology that mimics human intelligence through computer systems capable of learning, reasoning, and making decisions

independently (Russell & Norvig, 2021; Wahyuni, 2021). In the context of human resource management (HRM), AI refers to the use of algorithms and machine learning to automate and optimize HR processes, such as recruitment, selection, training, performance management, and employee retention (Marler & Boudreau, 2017; Jatobá et al., 2019). AI also acts as a "cognitive partner" that enhances HR professionals' analytical and decision-making capabilities through three layers: process automation, predictive analytics, and intelligent recommendation systems (Chamorro-Premuzic, 2022). Strategically, AI transforms the HR paradigm toward algorithmic resource management, reshaping how human resources are managed (Strohmeier & Piazza, 2021).

2.2. Employee Performance

Employee performance is defined as the work outcomes achieved by an individual based on organizational standards, responsibilities, and criteria, encompassing both quantity and quality (Armstrong & Taylor, 2014; Bernardin & Russell, 1993; Mathis & Jackson, 2017). Performance includes achieving targets, competencies, skills, and work behaviors that support organizational goals (Armstrong, 2020; Gibson et al., 2012; Mangkunegara, 2017). Additionally, performance reflects the level of success in completing tasks effectively and efficiently, influenced by individual capabilities, effort, and situational factors such as available opportunities (Robbins & Chen, 2019; Hasibuan, 2018).

2.3. Employee Engagement

Employee engagement is a multidimensional construct reflecting employees' psychological, affiliative, emotional, and cognitive attachment to their work and organization (Kahn, 1990). According to Saks (2006), engagement involves cognitive, emotional, and behavioral components that predict employee performance and organizational success. Employee engagement can be defined as the integration of an individual with their work role, where they express themselves physically, cognitively, and emotionally during task performance (May et al., 2004). Furthermore, Schaufeli et al. (2002) describe engagement as a positive mental state characterized by vigor, dedication, and deep involvement.

2.4. Perceived Job Security

Job security is defined as employees' perceptions of the stability and continuity of their employment position within the organization (Greenhalgh & Rosenblatt, 1984). This concept includes the certainty of employment contracts as well as the subjective belief that employees can maintain employment without the threat of termination (Sverke et al., 2002). It also involves organizational assurances of job stability, promotion opportunities, and career development, as well as income certainty (De Meulenaere, 2015; Daud, 2017). In addition, job security reflects psychological comfort and calm conditions related to job stability, which are influenced by factors such as automation and labor market dynamics (Arabi, 2000 in Gholamreza, 2011; Nur Wening, 2005; ILO, 2020).

2.5. AI Application in HR and Employee Performance

AI-based tools and applications can enhance employee engagement and overall job performance (Prentice et al., 2023). The integration of AI into e-HRM systems positively

impacts HR practices and employee development (Samman & Al Obaidly, 2024). AI-based performance evaluations offer more objective and efficient real-time assessments (Sampath et al., 2024; Riaz & Ghanghas, 2024). However, AI-driven feedback may lower perceptions among employees, particularly newcomers (Tong et al., 2021). AI implementation in HR has the potential to improve talent management, succession planning, and data-driven decision-making (Wirawan et al., 2024). AI can revolutionize HR practices, increasing employee productivity and satisfaction (Chukwuka & Dibie, 2024; Luhana et al., 2023).

H1. AI application in HR positively affects employee performance.

2.6. AI Application in HR and Employee Engagement

AI application in HR management can enhance employee engagement through tools like chatbots and real-time feedback, supporting personalized communication and collaboration (Mittal et al., 2023; Sundari et al., 2024). AI also aids in predicting engagement, improving retention, motivation, and job satisfaction (Sari et al., 2020; Kandpal et al., 2023). However, successful AI implementation requires addressing employee resistance and providing retraining (Sundari et al., 2024). When applied effectively, AI can improve efficiency, productivity, and employee satisfaction (Prasad et al., 2023; Dutta et al., 2022).

H2. AI application in HR positively affects employee engagement.

2.7. AI Application in HR and Perceived Job Security

Artificial Intelligence (AI) transforms the industrial landscape by automating routine tasks and boosting productivity but also raises concerns about job insecurity, particularly among white-collar workers and those with technical skills (Adhikari, 2024; Santhosh et al., 2023; Dahlin, 2024; Poba-Nzaou et al., 2021). Exposure to AI can increase stress and perceptions of job insecurity (Ali et al., 2024), especially in sectors like manufacturing, customer service, and delivery, including pharmaceutical production processes (Sinha et al., 2023; Manu et al., 2024). However, AI also creates new opportunities, such as roles in data analysis and machine learning, relevant to the pharmaceutical/biopharmaceutical industry (Tailor et al., 2023; Raj, 2024).

H3. AI application in HR positively affects perceived job security.

2.8. Employee Engagement and Employee Performance

Employee engagement, encompassing emotional commitment and involvement with the organization, has been shown to improve employee performance (Lorgat & Pillai, 2020; Kaur, 2023). Research indicates that employee engagement is positively associated with productivity, effectiveness, and organizational citizenship behavior (Motyka, 2018; Supriyanto et al., 2021). Engaged employees tend to perform better, enhancing the organization's competitive advantage (Kaur, 2023).

H4. Employee engagement positively affects employee performance.

2.9. Perceived Job Security and Employee Performance

Research shows that job insecurity negatively impacts employee performance (Sverke et al., 2019; Piccoli et al., 2019; Wang et al., 2015). However, factors such as high job security, supervisor support, and organizational justice can mitigate these negative effects (Fried et

al., 2003; Schreurs et al., 2012; Wang et al., 2015). Job satisfaction and organizational commitment also mediate the relationship between job security and performance (Yousef, 1998). Additionally, perceptions of temporary workers and national culture may influence this relationship (Kraimer et al., 2005; Yousef, 1998).

H5. Perceived job security positively affects employee performance.

2.10. AI Application in HR and Employee Performance Mediated by Employee Engagement

AI-supported tools and applications can enhance engagement and service performance (Prentice et al., 2023). AI-based compensation management influences employee engagement and performance in the manufacturing sector (Liu & Huang, 2024). AI-driven HR practices improve engagement and performance, particularly for highly engaged employees (Jia & Hou, 2024). AI also enhances engagement, performance, and job security (Malik, 2024). Technologies like sentiment analysis and chatbots revolutionize employee engagement (Rajeshwari, 2023; Mittal et al., 2023). Change leadership moderates the impact of AI on engagement and performance in dynamic environments (Wijayati et al., 2022).

H6. *Employee engagement mediates the relationship between AI application in HR and employee performance.*

2.11. AI Application in HR and Employee Performance Mediated by Perceived Job Security

AI adoption in the workplace has been shown to enhance employee engagement, service performance, and overall job performance (Prentice et al., 2023; Ghorbanzadeh et al., 2024; Malik, 2024). However, employees' perceptions of AI can affect their sense of job security and performance (Tung et al., 2024; López-García et al., 2024). Job security plays a critical role in mediating the impact of AI on employee engagement and performance (Prentice et al., 2023; Kraimer et al., 2005). Assessments of challenges and barriers faced by employees regarding AI can influence service performance, either through new job creation or job insecurity (Changqing He et al., 2023).

H7. Perceived job security mediates the relationship between AI application in HR and employee performance.

Conclude this section by summarizing how the literature review and hypotheses align with your research aims, emphasizing the study's potential contributions to theory, practice, or policy. Therefore, based on this relationship, the hypothesis proposed in this study is as follows:

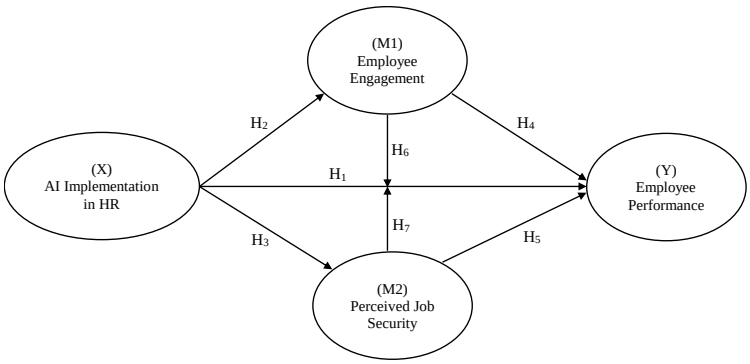

Figure 1. Conceptual Framework

III. Methodology

This study was conducted by collecting data from active employees at a biopharmaceutical company in Jakarta that has integrated artificial intelligence (AI) technology into its human resource management (HRM) processes. Respondents were selected intentionally through a purposive sampling approach, focusing on employees directly involved with AI-based HRM systems to ensure relevant and representative assessments. Data were collected via an online questionnaire distributed to employees who met the research criteria.

The measurement of variables in this study utilized several instruments adapted from credible literature, with all items rated on a 1-5 Likert scale (1 = strongly disagree, 5 = strongly agree). The implementation of AI technology in HRM was measured using 9 items sourced from Upadhyay & Khandelwal (2018) and Jarrahi et al. (2021), evaluating the application of AI in processes such as recruitment, training, and performance evaluation. Employee performance was measured with 8 items adapted from Bernardin & Russell (2013), focusing on productivity, work quality, and individual goal achievement. Employee engagement was assessed using 8 items derived from Kahn (1990) and Gallup (2020), reflecting employees' emotional, cognitive, and physical engagement with their work. Meanwhile, perceived job security was measured through 8 items adapted from Greenhalgh & Rosenblatt (1984) and Brougham & Haar (2018), exploring employees' sense of security regarding the impact of AI technology implementation in the workplace.

Data analysis was performed using the Structural Equation Modeling (SEM) method with a Partial Least Squares (PLS) approach, processed using SmartPLS 4.0 software. This approach was chosen for its ability to analyze relationships between variables in complex models, particularly with relatively limited sample sizes and data that are not entirely normally distributed. Thus, this method enables accurate testing of the research model's validity and reliability.

IV. Results and Discussion

4.1 Result

The distributed questionnaire resulted in 100 respondents from a biopharmaceutical company in Jakarta. The demographic information of the respondents in this study is presented in Table 1 below:

Table 1. Respondent Demographics

Criteria	Percentage
Gender	
Male	54%
Female	46%
Age	
< 25 years	12%

25–34 years	61%
35–44 years	27%
Last Education Level	
Diploma	23%
Bachelor (S1)	74%
Postgraduate (S2/S3)	3%
Length of Employment in Current Company	
< 1 year	15%
> 6 year	24%
1–3 year	43%
4–6 year	18%

Source: data processed by researchers (2025)

The results of the validity and reliability test of the research model show that out of a total of 33 items, only 21 items have significant factor loading values, exceeding the minimum threshold of 0.7, thus meeting the criteria of convergent validity.

Table 2. Reliability & Validity Test

Variable	Construct Reliability and Validity				R-Square	
	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)	Average variance extracted (AVE)	R-square	R-square adjusted
AI in HR	0.833	0.858	0.880	0.596		
Employee Engagement	0.828	0.841	0.877	0.588	0.088	0.078
Perceived Job Security	0.861	0.876	0.899	0.642	0.152	0.143
Employee Performance	0.863	0.869	0.898	0.595	0.448	0.430

Source: data processed by researchers (2025)

Based on the data analysis and path analysis of the impact of Artificial Intelligence (AI) implementation in Human Resource (HR) management on employee engagement, perceived job security, and employee performance, as well as examining the mediating role of employee engagement and perceived job security in these relationships, Table 3 presents the hypothesis testing results, showing the extent to which these variables are related and contribute to employee performance in the context of AI implementation in a biopharmaceutical company in Jakarta. Below is a detailed discussion based on the hypothesis testing results presented:

Table 3. Hypothesis Test

Hypothesis	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	P values	Decision
Application AI in HR -> Perceived Job Security	0.389	0.409	0.090	4.348	0.000	Accepted
Application AI in HR -> Employee Engagement	0.296	0.319	0.089	3.323	0.001	Accepted
Application AI in HR -> Employee Performance	0.334	0.334	0.112	2.973	0.003	Accepted
Employee Engagement -> Employee Performance	0.373	0.379	0.109	3.425	0.001	Accepted
Perceived Job Security -> Employee Performance	0.235	0.238	0.108	2.178	0.029	Accepted
Employee Engagement x Application AI in HR -> Employee Performance	0.117	0.118	0.095	1.233	0.218	Not Accepted
Peceived Job Security x Application AI in HR -> Employee Performance	0.154	0.155	0.154	1.973	0.049	Accepted

Source: data processed by researchers (2025)

Based on the statistical calculations that have been conducted, the path analysis diagram for this research can be seen in the following figure:

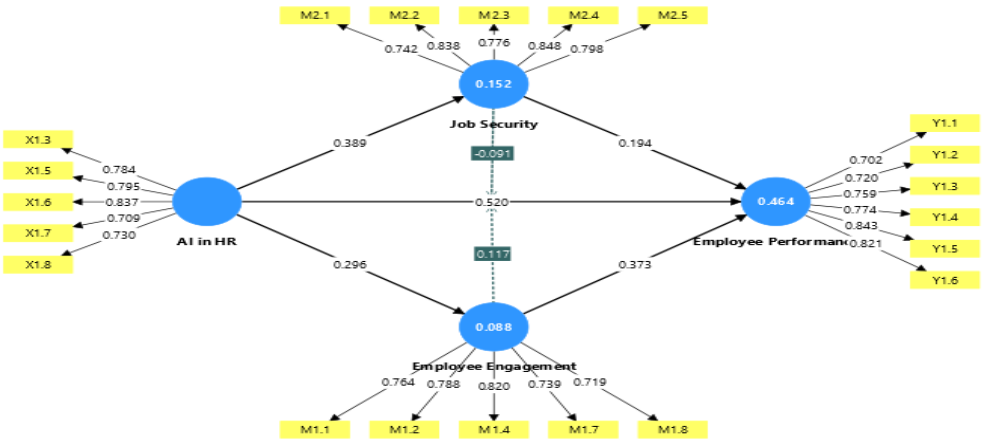

Figure 2. Analysis of Partial Least Squares Structural Equation Modeling

Source: Data processed by the researcher (2025)

The hypothesis testing results indicate that the implementation of Artificial Intelligence (AI) in Human Resource (HR) management has a positive effect on Employee Engagement (p-value = 0.001), Employee Performance (p-value = 0.003), and Job Security (p-value = 0.003), thus hypotheses H1, H2, and H3 are accepted. Furthermore, Employee Engagement positively affects Employee Performance (p-value = 0.001), supporting the acceptance of hypothesis H4. Job Security also positively affects Employee Performance (p-value = 0.029), so hypothesis H5 is accepted. However, in the mediation path from AI implementation in HR to Employee Performance through Employee Engagement, the results show p-value = 0.218, thus hypothesis H6 is rejected, indicating that AI in HR does not affect Employee Performance through Employee Engagement. On the other hand, the mediation path from AI implementation in HR to Employee Performance through Job Security has a p-value = 0.049, supporting the acceptance of hypothesis H7, which shows that AI in HR affects Employee Performance through Job Security as a mediator. Overall, AI implementation in HR has a positive impact on Employee Performance, both directly and through Job Security mediation, although not through Employee Engagement.

4.2 Discussion

Implementation of AI in HR positively affects employee performance (H1)

The results of this study confirm the hypothesis that AI implementation in HR positively affects employee performance. This finding aligns with those of Jia et al. (2020) and Brynjolfsson & McAfee (2014), who show that AI application in various HR aspects, such as training, data-driven decision-making, and performance management, enhances employee productivity and performance overall. The integration of AI in e-HRM transforms traditional HR practices, leading to improved efficiency and employee development (Samman & Al Obaidly, 2024). Additionally, AI-based assessments provide direct feedback and more accurate performance evaluations (Chukwuka & Dibie, 2024). Despite challenges related to data privacy and job displacement, AI implementation offers significant benefits

in improving performance and employee engagement (Srivastava & Pandita, 2024; Islam, 2024).

Implementation of AI in HR positively affects employee engagement (H2)

The results of this study show that AI implementation in HR has a significant positive impact on employee engagement. This is in line with previous findings suggesting that the use of AI in HR, such as in recruitment and training processes, can provide personalized experiences that enhance employee engagement in the workplace (Malik, 2024; Sundari et al., 2024). AI tools can increase operational efficiency by automating routine tasks, allowing HR teams to focus on strategic initiatives, thereby enhancing employee engagement (Sundari et al., 2024). Moreover, AI improves productivity, communication, and creates a more collaborative work environment (Paigude et al., 2023). AI also enables companies to provide more individualized experiences, which in turn enhances employee motivation and commitment to the organization.

Implementation of AI in HR positively affects job security perception (H3)

This finding supports the hypothesis that AI implementation in HR positively affects job security perception. The use of AI in HR management, such as in performance monitoring and employee development processes, provides a greater sense of certainty and stability, reducing anxiety about unemployment or job insecurity (Jia et al., 2020). However, employees' perceptions of AI integration can influence their intention to adopt this technology in HR (Arora & Mittal, 2024). Interestingly, AI and gamification in HR can reduce job insecurity and alleviate concerns about job loss (El-Menawy, 2022; Roohani, 2023). Although there are perceptions that AI could replace jobs, it may actually encourage career exploration behavior through job insecurity and psychological stress (Presbitero & Teng-Calleja, 2022). Therefore, successful AI integration in HR requires clear communication, skill-enhancement programs, and employee involvement to mitigate negative impacts and strengthen job security perceptions (Sadeghi, 2024).

Employee engagement positively affects employee performance (H4)

This study confirms the hypothesis that employee engagement positively affects employee performance. Engaged employees tend to have higher productivity, commitment, and job satisfaction, which leads to improved performance (Dwi Astuti & Suwandi Suwandi, 2022; Maaz Lorgat & V. Pillai, 2020; A. Supriyanto et al., 2021). Factors such as job satisfaction, effective performance management, and organizational support play a crucial role in mediating this relationship (Rianti Setyawasih & Haris Budiyono, 2017). Employees who feel valued and emotionally connected to their work tend to show better performance (Solomon Markos, 2010). Additionally, fairness in performance evaluations also influences employee engagement and performance (Dr. A. Selvarasu & N. Sastry, 2014).

Job security perception positively affects employee performance (H5)

This finding also supports the hypothesis that job security perception positively affects employee performance. Higher job security perceptions provide peace of mind for

employees, reduce stress, and allow them to focus on their tasks, ultimately contributing to better performance (Dekker and Schaufeli, 1995). A study in Nigeria showed that job security significantly enhances employee performance in the construction and private sectors (Ofre & Andow, 2022; Chinyelu, 2018). Research at Miami International Airport also revealed that employees with higher job security performed better (Jimenez & Didona, 2017). Similarly, a cross-cultural study by Lu et al. (2017) showed that job demands positively influence performance when job security is high. Thus, job security perception has a significant impact on employee performance across various sectors and work contexts.

Employee engagement does not mediate the relationship between AI implementation in HR and employee performance (H6)

This study shows that employee engagement does not serve as a mediator in the relationship between AI implementation and employee performance. Some studies suggest that this relationship is not always straightforward. The impact of AI on employee performance may be mediated by factors such as knowledge sharing and work engagement (Khan et al., 2024) or trust in AI tools (Marimon et al., 2024). Maharani et al. (2024) also found that the mediating role of AI between organizational practices and employee performance was not statistically significant, suggesting that while AI influences performance, other factors like trust in AI tools or leadership play a more significant mediating role than employee engagement. Thus, these findings suggest that employee engagement does not always mediate the relationship between AI implementation and employee performance, as AI can improve performance directly through other factors more relevant to a technology-supported work environment.

Job security perception mediates the relationship between AI implementation in HR and employee performance (H7)

This finding supports the hypothesis that job security perception mediates the relationship between AI implementation in HR and employee performance. The results show that AI adoption has been shown to enhance innovative behavior, work engagement, and overall performance (Ghorbanzadeh et al., 2024; Prentice et al., 2023; Malik, 2024). Job security plays a crucial role in mediating this relationship, with higher job security linked to increased engagement and service quality (Prentice et al., 2023; Malik, 2024). However, AI implementation may also raise concerns about identity and job insecurity, potentially affecting employee well-being (Gull et al., 2023). Positive perceptions of the opportunities offered by AI and proper training can alleviate these concerns and improve performance (Le Tung et al., 2024; López-García et al., 2024). Organizations that strategically integrate AI and provide appropriate training can enhance efficiency and employee satisfaction, leading to better performance (López-García et al., 2024). This indicates that AI can help create a safer work environment and support better performance.

V. Conclusion

Based on the findings of this study, the implementation of Artificial Intelligence (AI) in Human Resource (HR) management shows a significant impact on employee engagement,

job security, and employee performance. This study confirms that AI in HR positively affects various aspects that influence employee performance. AI has proven to enhance operational efficiency, automate HR processes, and improve the employee experience through personalization. Employee engagement, which directly influences employee performance, is strengthened by a higher sense of job security, which provides stability and reduces work-related stress. Furthermore, job security perception mediates the relationship between AI implementation and performance, helping to alleviate uncertainty related to the adoption of new technologies in the workplace.

Theoretical Implication: This study adds to existing knowledge by showing that AI in HR positively impacts employee engagement, job security, and performance. It introduces job security perception as a mediator between AI implementation and performance, offering new insights into how technology adoption affects employee behavior. Future research can explore additional factors influencing AI acceptance and employee performance.

Managerial Implication: For managers, the study emphasizes the need for transparent communication and training to address employees' concerns about AI and its impact on job security. By ensuring employees understand AI's role in enhancing performance rather than replacing jobs, managers can foster a supportive environment that boosts engagement and reduces stress. This approach helps maximize AI’s potential while maintaining a motivated, secure workforce.

However, this study has several limitations. (1) It was conducted only in a biopharmaceutical company in Jakarta, so the findings may not be generalized; (2) the sample size of 100 respondents is relatively small and may not reflect the full range of employee perceptions; (3) the quantitative approach with a survey does not delve into qualitative factors; (4) external factors such as regulations or market trends were not considered. Future research is recommended to expand the scope, use a qualitative approach, and involve more industry sectors for a deeper understanding of the impact of AI in HR.

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