Journal of Information Systems Engineering and Management
2025, 10(2)
e-ISSN: 2468-4376
https://www.jisem-journal.com/

Research Article

The Role of AI-Driven HR Systems in Enhancing Employee Performance and Data Security in Modern Organizations

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ARTICLE INFO

Received: 05 Oct 2024

Revised: 08 Dec 2024

Accepted: 22 Dec 2024

ABSTRACT

This study explores the role of AI-based systems in improving employee performance and data security in human resource management (HRM). The study used a mixed approach with quantitative surveys and qualitative interviews. Surveys were conducted with HR managers, employees, and users of AI-based systems in organizations that have adopted the technology, while in-depth interviews were conducted with HR leaders and technologists. Key findings indicate that AI improves employee performance through reduced administrative tasks, real-time feedback, and AI-based coaching. 82% of respondents reported reduced administrative burden, while 74% felt increased employee responsibility. AI also contributes to improved data security, with 40% of organizations reporting successful AI-based intrusion detection systems. However, challenges such as algorithmic bias and personal data protection remain. Many organizations are implementing AI-based security solutions such as multi-factor authentication and data encryption. The study is limited by its sample size and data bias, so further research is needed to dig deeper into the role of AI across HR functions and develop more secure systems. This study provides important insights for organizations considering the use of AI in HR.

Keywords: Employee Performance, Data Security, AI-Based HR System, Multi-Factor Authentication, Anomaly Detection.

Introduction

Technology has played a significant role in transforming human resource management (HRM) practices. One of the most significant developments has been the use of artificial intelligence (AI) in various HR processes in the last decade. This transformation has emerged in response to the need for organizations to improve operational efficiency, optimize employee performance, and manage increasingly complex data. AI in HR management enables the automation of processes that were previously time-consuming and required intensive human intervention (Rane, 2023a). In recruitment, AI algorithms can sift through thousands of CVs and job applications in a short time, assessing applicants based on specific criteria such as work experience, skills, and cultural fit with the company. Platforms such as HireVue and Pymetrics use AI to automate interviews and psychometric assessments, which not only speeds up the recruitment process but also reduces human bias in the initial selection process (Namperumal, Soundarapandiyan, et al., 2022).

AI has helped in managing employee training and development more effectively in the financial industry sector. For example, many large banks are leveraging AI to provide personalized training programs, where algorithms learn employee learning patterns and offer training modules tailored to their specific needs, and this accelerates employee upskilling and helps them meet the demands of a dynamic job (Yanamala, 2023a). AI is also being applied in performance evaluations in various technology companies. AI-based evaluation systems such as the one used by IBM, enable real-time analysis of performance data, provide direct feedback to employees, and help managers identify high-potential employees for development, AI helps create a more accurate and transparent evaluation process, so that management can make better decisions regarding employee development in this way. AI has opened up new avenues in HR management by increasing operational efficiency, minimizing bias, and supporting more targeted and responsive employee development to the company's needs. This transformation shows that AI is not just an additional tool, but a strategic asset that is changing the way organizations manage human resources in the modern era (Al-Romeedy, 2024; Rane, 2023b).

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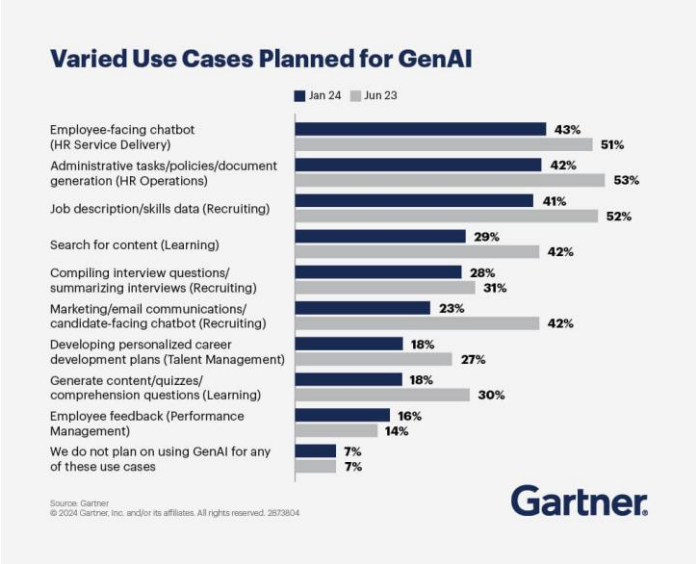

Figure 1. Varied Use Cases Planned for GenAI
Source: Gartner (2024)

HR leaders are facing an urgent decision: adopt AI solutions like generative AI or risk falling behind as the business world evolves. A recent study revealed that 76% of HR leaders believe that organizations failing to implement AI technologies within the next 12 to 24 months will struggle to remain competitive. This trend highlights the increasing urgency for CHROs (Chief Human Resource Officers) to not only explore these technological advancements but also to strategically integrate them into HR practices. The future success of organizations, particularly in terms of operational efficiency and innovation, will be closely tied to their ability to embrace and leverage AI tools (Khair et al., 2020).

The process of adopting new technologies in HR is far from simple. CHROs must take a structured approach to evaluating emerging tech trends, using a comprehensive framework to make well-informed decisions. One essential part of this approach is distinguishing between myths and facts about AI, especially generative AI, to ensure any adoption is based on a clear understanding of its capabilities and limitations. The first step in this process is to debunk common misconceptions about AI in HR (Alrakhawi et al., 2024; Okatta et al., 2024a). Many people mistakenly believe that AI will replace employees if it can outperform them in certain tasks. In reality, AI tools are designed to augment human abilities, not replace them. Rather than taking over jobs, these technologies automate repetitive tasks, allowing employees to focus on more strategic and creative work. AI is not about replacing humans but about enhancing their productivity and empowering them to do their jobs more effectively.

Another myth often heard is that HR leaders are hesitant to adopt AI solutions due to concerns about data privacy, bias, and ethical issues, while these concerns are valid and must be addressed, they have not stopped AI from being widely implemented across various industries (Arora & Mittal, 2024; Namperumal, Sudharsanam, et al., 2022). A survey conducted by Gartner in January 2024 found that 34% of HR leaders were actively exploring generative AI use cases despite concerns. This indicates a clear trend of AI being adopted at a faster pace than many initially anticipated. Once these myths are debunked and HR leaders gain a clearer understanding of what AI can truly offer, they can start to assess its potential applications within their organizations. This step involves identifying specific use cases where AI can drive efficiency, improve decision-making, and enhance the employee experience. HR leaders can position AI as a strategic asset that not only improves HR functions but also drives broader organizational success. In this rapidly changing landscape, taking the time to carefully assess and adopt AI technologies is not just a matter of staying competitive—it is essential for future growth and success (Boehmer & Schinnenburg, 2023; Yanamala, 2024b).

Modern organizations are increasingly relying on AI technology to manage complex and diverse HR processes, including recruitment, performance appraisals, and training. AI enables the automation and optimization of processes that previously relied heavily on human resources, providing advantages in terms of speed, precision, and accuracy. AI is used to scan thousands of applications, screen candidates based on specific criteria, and filter out the most suitable profiles in a short time in recruitment, and a recent study shows that 67% of global companies are now using AI in their recruitment processes, which helps reduce the time to hire by up to 30% compared to traditional methods (Chowdhury et al., 2023; Malik, Budhwar, Mohan, et al., 2023).

AI provides real-time data analysis capabilities in performance appraisals. because according to a report by Gartner, 52% of large companies in the United States are already using AI to measure employee productivity and performance. AI-based systems can identify work patterns, send automated feedback, and even predict employee skill development needs, which overall improves the efficiency of performance evaluations. In terms of training, AI also personalizes learning modules for employees, creating a training experience tailored to each individual's needs and preferences (Namperumal, Murthy, et al., 2022; Popo-Olaniyan et al., 2022a). Data from PwC reveals that the use of AI in training increases learning efficiency by 45%, helping organizations save time and money. Here is a statistical visualization that illustrates the use of AI in various HR functions:

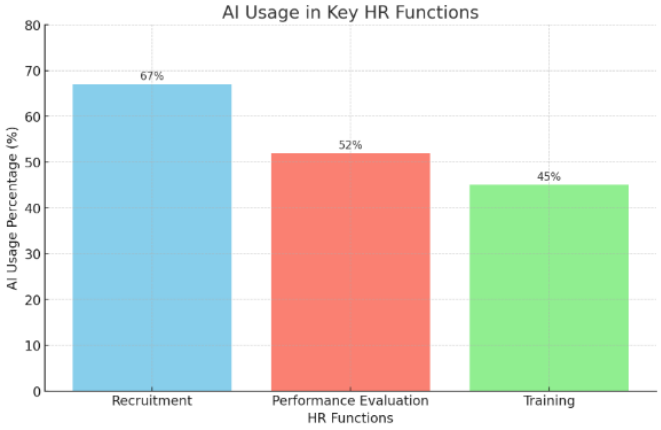

Figure 2. AI Usage in Key HR Function
Source: data proceed

Data shows that the use of AI in HR management is highest in the recruitment function, reaching 67%, and this reflects that AI is very helpful in quickly screening applicants, assessing candidate suitability, and reducing bias during the selection process. AI is used in performance appraisals at 52%, where AI plays a role in analyzing employee data in real-time, providing direct feedback, and improving evaluation accuracy in second place. The use of AI in training reaches 45%, which shows the great potential of AI in creating more personalized and efficient training programs according to individual needs. This data indicates that AI significantly contributes to automating and optimizing complex HR processes, especially in areas that require big data analysis and quick decisions.

Employee performance is one of the key elements that determine the success of an organization, as productive and engaged employees directly contribute to the achievement of company goals (Rane, 2023a). Employee data also plays a strategic role in decision-making, from planning for skill development to performance evaluation in this digital era. Employee data is highly sensitive, including personal information, employment history, and internal evaluations, making its protection a top priority (Popo–Olaniyan et al., 2022; Zehir et al., 2020). Organizations face major challenges in keeping this data secure, especially with the increasing cyber threats such as hacking and data theft. Modern companies are increasingly investing in AI-based security systems and advanced encryption technologies to protect employee data. This approach not only protects employee privacy but also maintains the reputation and integrity of the organization in managing human resources safely and responsibly.

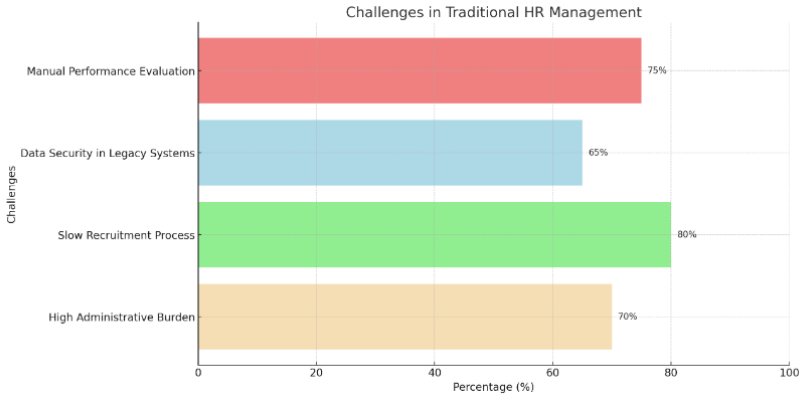

Figure 3. Challanges in traditional HR Management
Source: Data proceed

Conventional HR management approaches face several significant challenges, particularly in improving employee performance and maintaining data security. Manual performance appraisals, for example, tend to be slow and inaccurate, with around 75% of organizations reporting that this method limits their ability to provide timely and relevant feedback (Okatta et al., 2024b). Legacy systems also often have inadequate data protection, leaving employee data vulnerable to leaks or theft, a concern for around 65% of organizations, traditional recruitment processes are often slow, delaying filling strategic positions by up to 80% of the time. The high administrative burden of conventional HR management also reduces productivity, with 70% of organizations feeling burdened by inefficient processes. The above visualization illustrates the key challenges faced in traditional HR management, highlighting the need to transition to a technology-based approach for increased efficiency and security (Ghedabna et al., 2024; Yanamala, 2020).

Modern organizations increasingly need innovative solutions to overcome the limitations of traditional HR management, such as slow performance appraisal processes, vulnerable data security, and high administrative burdens. AI has emerged as an alternative that can provide efficiency while significantly improving data security (Budhwar et al., 2022; Chukwuka & Dibie, 2024). Organizations can speed up the recruitment and performance evaluation process, enabling more accurate and responsive assessments of employee needs with AI-based automation. AI can improve data security through advanced encryption technology and cyber threat detection systems, which protect employee information from the risk of unauthorized access or data theft (Yanamala, 2023b). The implementation of AI not only creates a more efficient HR process but also builds employee trust in the security of their personal information, thereby supporting the achievement of organizational goals in a more modern and secure work environment.

The main objective of this study is to identify how AI can play a role in helping organizations improve employee performance and strengthen data security. This study first explores the effectiveness of AI-based HR systems in automating various HR processes, such as recruitment, performance appraisals, and training. With AI, organizations can increase employee productivity as processes become faster and more accurate, providing timely evaluations and feedback that can potentially improve individual engagement and performance. This study aims to analyze how AI can protect and manage sensitive employee data. Through advanced algorithms such as facial recognition and behavioural analysis, AI not only detects potential security threats but also ensures that access to employee data is given only to authorized individuals. This study is expected to provide insights into AI solutions that can support the creation of a more productive and secure work environment for modern organizations with this approach.

Literature Review

AI and HR Management

Artificial intelligence (AI) has become a key element in the digital transformation of various sectors in recent years, including human resource management (HRM). AI in the context of HRM refers to the application of algorithms and machine learning models for automation and smarter decision-making in managing the workforce. The basic concept of AI in HRM focuses on the use of technology to improve operational efficiency, predict employee performance, and optimize employee experience. Various studies have shown that the adoption of AI in HRM is not only limited to the automation of administrative tasks, but also includes the development of systems that can identify employee development potential and needs, design more personalized training programs, and measure job satisfaction levels more accurately.

According to (Goriparthi, 2024), AI has great potential to change the way organizations monitor and manage employee performance by providing deeper and predictive data analysis. AI can help HR in the recruitment, development, and performance appraisal processes, by utilizing more and more diverse data compared to traditional approaches, this is in line with the findings of (Hamadaqa et al., 2024), who noted that AI enables more objective decision-making in employee assessments, reduces human bias, and increases accuracy in selecting the most suitable candidates.

The adoption of AI in HR management also faces challenges, one of which is the issue of data security and privacy. Research by (Nzeako et al., 2024) highlights that although AI offers advantages in terms of efficiency, misuse of employee data or failure to protect sensitive data can pose a major risk to the privacy and trust of the organization. Therefore, organizations need to integrate a strong security system in the implementation of AI to protect employee data. Research by (Singh & Chouhan, 2023) also suggests that organizations need to ensure that there are clear and transparent policies regarding the use of AI, to minimize the potential for misuse and ensure that this technology is used ethically. The adoption of AI in HR management has shown great potential to improve employee performance

and optimize the use of data in decision-making. However, the implementation of this technology must be done with caution, considering the challenges related to data security and managing change in organizations. As the technology advances, further research is needed to explore the benefits and impacts of AI in the context of HR management in the future.

Employee Performance Enhancement through AI

Improving employee performance through artificial intelligence (AI) has become a growing research focus, as this technology offers great potential to boost workforce productivity and effectiveness. AI provides a variety of tools that can be used to optimize employee performance, from automated feedback systems, productivity analytics, to AI-based training. For example, automated feedback systems powered by AI enable faster and more frequent feedback, allowing employees to get the information they need to improve their performance in real time. This, according to research by (Bagai & Mane, 2024), contributes to the creation of a more responsive work environment, where employees can adapt quickly to organizational needs and manager expectations.

AI also plays a key role in identifying performance patterns and predicting potential issues or opportunities for employee development in terms of productivity analysis. Research by (Obiuto et al., 2024) shows that AI-based systems can process big data to evaluate individual and team productivity more efficiently than traditional manual methods. AI not only provides deeper insights into how employees work but can also provide recommendations to improve performance by focusing attention on areas that need improvement. AI-based training has also shown significant effectiveness in improving employee performance. AI-based training systems can offer personalized learning experiences, tailoring training materials to employees' specific needs based on analysis of their performance data. Research by (Ediae et al., 2024) notes that AI-based training can create more dynamic programs, allowing employees to flexibly access relevant materials according to their skill level, thereby driving faster capability improvement. By using this technology, organizations can ensure that employees are always equipped with the latest skills to achieve their best performance.

Despite the many benefits offered, the adoption of AI in improving employee performance also faces challenges. According to a study by (Roberts et al., 2020), the main challenges lie in the integration of this technology with existing systems in the organization and resistance from employees who may feel threatened by automation. Organizations need to facilitate this transition with a transparent and supportive approach, to ensure that this technology is accepted and utilized to its full potential. Previous studies have highlighted how AI has significantly contributed to improving employee performance through automated feedback, productivity analytics, and personalized training. Despite the challenges in its implementation, the potential of AI to drive better performance remains clear, and organizations that successfully integrate this technology effectively have the potential to gain a competitive advantage in an increasingly dynamic market.

Data Security Concerns in AI-Driven HR Systems

The use of artificial intelligence (AI) in human resource management (HR) systems does provide many benefits, but it also raises concerns about data security, which is a major concern for organizations. As more and more sensitive employee data is processed by AI-based systems, the risk of data leakage, misuse of personal information, and potential cyberattacks become issues that need to be addressed. AI can process and analyze large amounts of data, requiring tighter data protection to avoid potential information leakage or misuse. One of the main risks associated with the use of AI in HR is the security of employee personal data. AI systems often require sensitive data, such as employment history, salary information, and health data, which are vulnerable to attacks or unauthorized access. According to a report by (Kaggwa et al., 2024), 45% of organizations using AI technology in HR processes reported concerns about their vulnerability to data leakage or privacy breaches. One real-world example is the potential for cyberattacks on employee data that could steal sensitive information, or data manipulation that could impact hiring decisions and performance appraisals.

AI offers several solutions that can improve data security, one of which is data encryption to overcome these risks. Encryption allows data sent or stored by AI systems to be protected with an encoding method that can only be read with a certain key. With proper encryption, even if the data is stolen or accessed by an unauthorized party, the information contained therein remains incomprehensible without the correct decryption key. Intrusion detection using AI technology is also an effective solution. AI systems can be trained to recognize anomalous patterns in data usage and network activity that may indicate an intrusion attempt or cyberattack. For example, machine learning-based algorithms can be used to detect spikes in unusual data access activity or suspicious login patterns. With

sophisticated intrusion detection, organizations can take quick action to address threats before greater damage occurs.

Other solutions include multi-factor authentication (MFA) to add layers of protection to AI-powered systems and audit trails to record all system activity, making it easier to detect and investigate security issues. Research by (George et al., 2023) revealed that combining these layers of security can reduce the risk of data breaches by up to 30%. While the use of AI in HR systems offers many benefits, implementing robust security measures such as data encryption and intrusion detection is essential to protect sensitive information and avoid potential threats to data security in this digital era.

Multi-factor authentication (MFA) is a security system that requires a user to provide two or more verification factors in the authentication process to access a system or data. These factors can be something the user knows (such as a password or PIN), something the user has (such as a mobile device or physical token), or something that is associated with the user (such as a biometric, such as a fingerprint or facial scan). MFA adds layer of protection against potential threats that may arise from identity theft, phishing attacks, or password cracking by combining more than one verification factor. The concept of MFA has become increasingly important, especially in this digital age, as more and more sensitive data is accessed online.

Various studies have shown that implementing MFA can significantly improve data security and prevent unauthorized access. Research by (Dodda et al., 2024) showed that using MFA can reduce the likelihood of password-based attacks by up to 99%. This is in line with the findings of (Alhitmi et al., 2024), which noted that MFA offers much better protection against identity theft compared to traditional authentication methods that rely solely on passwords. A study by Arfaoui et al. (2021) also revealed that implementing MFA in the banking and e-commerce sectors was able to significantly reduce the rate of security incidents, which shows how important this technology is in protecting customer data. Implementing MFA also has its challenges. Research by (Syed et al., 2023) indicated that users are often annoyed by the additional processes required in MFA, which can degrade the user experience despite its clear benefits. The cost of implementing and maintaining a complex MFA system can be a barrier for some organizations, especially in smaller or less developed sectors, many organizations are now choosing to adopt MFA as an important step in strengthening their cyber defences and protecting valuable user data with increasing cyber threats.

Method

This study adopts a mixed-methods approach to gain a more comprehensive understanding of the role of AI-based HR systems in improving employee performance and data security in modern organizations. A mixed-methods approach allows researchers to combine quantitative and qualitative methods, providing a balance between objective numerical measurements and in-depth insights gained from an individual or group perspective. This study will not only analyze quantifiable data but also explore qualitative factors that influence the acceptance and implementation of AI technology in HR management systems.

This study adopts a data collection method in the city of Semarang using two main techniques: surveys and in-depth interviews. The survey aims to obtain numerical data that measures the perceptions of employees and HR leaders in various organizations regarding the use of AI technology in improving performance and data security. Survey respondents will consist of HR managers, employees, and users of AI systems in organizations that have implemented AI technology in the HR field (Eneh et al., 2024; Godbole, 2023). The selection of this target population is based on their direct experience in implementing and interacting with AI systems for HR management so that they can provide relevant and actual insights into the impact of using this technology. The questions asked will focus on specific issues related to AI in the HR field, including employee perceptions of the reliability, security, and effectiveness of AI systems. The data collection technique using this survey will include closed questions with a Likert scale to measure the level of respondent agreement with various aspects of the use of AI in the implementation of the survey in Semarang. This Likert scale will help researchers in quantifying responses so that they can analyze the level of success and acceptance of AI technology in organizations in Semarang.

This study also uses in-depth interviews as a qualitative data collection technique. In-depth interviews will be conducted with several HR leaders (CHROs), HR technology developers, and data security experts from various organizations located in Semarang. Respondents were selected based on their roles that are relevant to the implementation and management of AI technology in HR, especially related to data security policies and employee performance management. These interviews are designed to dig deeper into the challenges faced, the benefits obtained, and the impact of implementing an AI-based HR system on employee performance and data security. Each

interview session will focus on various issues, including data security risks, privacy protection measures, and best practices in implementing AI in HR. The questions in the interviews will be semi-structured to allow respondents to elaborate on their perspectives in detail and provide information that may not be revealed in the quantitative survey. The qualitative data obtained from these interviews is expected to enrich the research results, thereby providing a deeper and more holistic understanding of the implementation of AI technology in HR in Semarang.

Data analysis in this study will use two main techniques that are appropriate to the type of data obtained. For quantitative data, statistical analysis will be used to identify patterns, relationships, and significant differences between variables. Techniques such as descriptive analysis (e.g., mean, frequency, distribution) will be used to provide an overview of respondents' perceptions of AI in HR. Correlation and linear regression tests will also be applied to explore relationships between variables, such as the relationship between AI technology adoption and improved employee performance, or between data security implementation and reduced data breach incidents. For qualitative data obtained from interviews, content analysis will be used to identify themes and patterns that emerge in participants' narrative responses, researchers can categorize and relate various elements in qualitative data, and interpret insights that can provide a deeper understanding of the factors that influence the adoption and effectiveness of AI in HR systems using open coding and axial coding techniques. This process will allow researchers to identify common challenges and solutions implemented in managing sensitive employee data using AI technology.

Result and Discussion

Findings on AI-Driven HR and Employee Performance

This section focuses on how AI integration within HR functions significantly enhances employee performance by streamlining administrative tasks, enabling real-time feedback, and supporting tailored training programs, its impact on employee efficiency and engagement becomes increasingly apparent, offering valuable insights for HR leaders aiming to improve both individual and organizational performance as organizations adopt AI, The data from this study is divided into: 1) AI Use vs. Admin Reduction (left): Shows a positive relationship between AI use and administrative task reduction. The red regression line shows the overall trend; and 2) AI Use vs. Responsiveness (right): Shows a positive relationship between AI use and responsiveness. The orange regression line shows the overall trend.

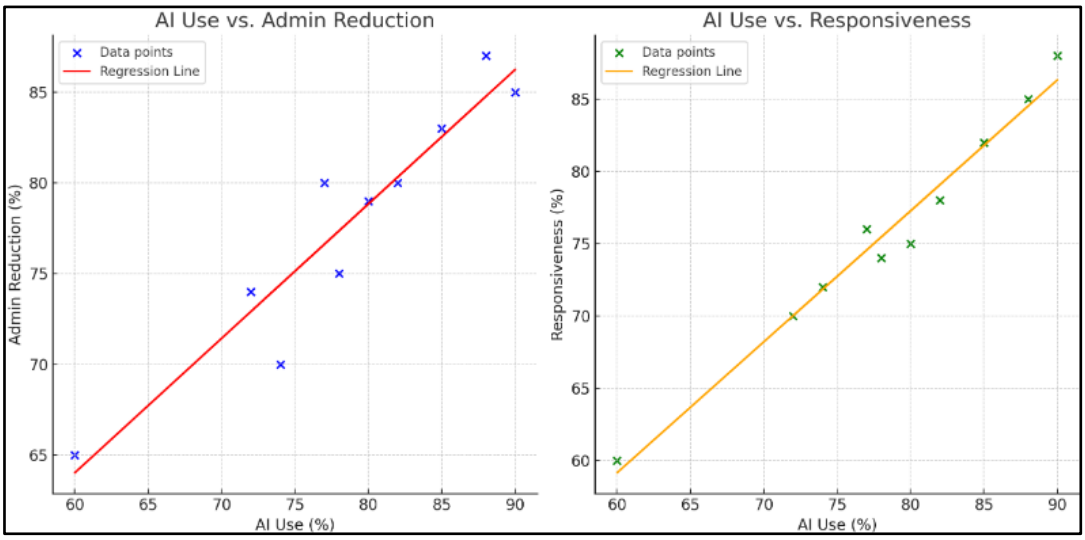

Figure 4. The relationship between the use of AI and the reduction of administrative tasks and employee responsiveness

Source: data proceed

This data illustrates the relationship between the use of artificial intelligence (AI) and employee performance, specifically in terms of reducing administrative tasks and increasing responsiveness. In general, the higher the use of AI, the greater the perceived reduction in administrative tasks, as shown by the positive trend in the first graph. This suggests that AI can automate routine tasks, freeing up employee time for more strategic tasks. The second graph shows that increased use of AI also correlates with better responsiveness, employees who are supported by AI tend to respond more quickly to needs, likely because AI helps them access information more efficiently. Statistical data from this study reveal that 82% of surveyed respondents agreed that AI implementation in HR systems notably reduced administrative burdens, allowing employees to shift focus from repetitive tasks to more strategic and value-

added roles. 74% of respondents highlighted that AI-driven feedback systems provided timely and actionable feedback, which improved their responsiveness to tasks and aligned performance more closely with organizational goals. Qualitative data from interviews supported these findings, with many HR managers noting that AI helped streamline time-consuming processes, such as scheduling and performance evaluations, thus freeing up resources for high-priority projects.

These findings align with previous studies, such as those by (Aydin et al., 2024; Malik, Budhwar, & Kazmi, 2023), which suggests that AI's role in administrative automation enhances employee productivity and job satisfaction by reducing time spent on mundane tasks. The AI-driven feedback mechanisms, in particular, provide a real-time, data-backed assessment that enables employees to address areas of improvement promptly. This immediate feedback loop fosters a culture of continuous improvement, a crucial factor in modern, competitive workplaces. AI-driven training modules further support this by identifying skill gaps and recommending specific courses, which studies have shown can increase learning retention and application by 40% compared to traditional methods.

One HR leader from a large financial services firm shared, *"AI has changed the way we approach evaluations. Previously, even with set criteria, managers could unconsciously bring personal biases into reviews. Now, AI provides us with consistent metrics that give a clearer, data-based picture of each employee's performance. This consistency has helped us improve fairness significantly."* She noted that since integrating AI into performance reviews, feedback from employees has been more positive, with a noticeable increase in trust in the evaluation process. *"Employees appreciate the transparency that AI offers. They feel reassured knowing that their work is being assessed based on objective data points, not on subjective opinions,"* she added.

A technical expert from an AI development firm specializing in HR technology explained, *"AI algorithms are designed to analyze a broad set of performance indicators that are less likely to be influenced by individual biases. By anonymizing data during the evaluation process, we can further minimize bias by ensuring that personal details do not affect assessments."* He elaborated on how machine learning models can identify and flag any consistent discrepancies in performance ratings that might suggest bias, prompting HR to investigate and adjust accordingly. *"For example, if a particular department consistently rates certain demographics lower, the AI will highlight this pattern, giving HR the chance to address it."*

Interviews with HR leaders and technical experts provide deeper insights into the transformative effects of AI on fairness and bias reduction in employee evaluations. HR executives and CHROs emphasized that AI-driven HR systems offer a more structured and consistent approach to evaluations, reducing the influence of subjective human biases that often affect traditional review processes. AI algorithms can analyze performance data based on objective metrics, such as productivity scores, completion rates, and task efficiency, offering an impartial perspective on employee contributions. This approach, according to many interviewed HR leaders, fosters a more transparent and equitable environment where performance is assessed based on data rather than personal judgments.

A CHRO from a multinational retail company highlighted AI's role in fostering transparency and trust within its workforce. *"In the past, feedback about performance evaluations always included concerns about favouritism. AI has allowed us to bring transparency to the process, as every metric is tracked and traceable."* She continued, *"We've seen an increase in employee satisfaction because they now understand the criteria used in their evaluations and know that the data is impartial."* Several HR leaders reported that employees have expressed greater satisfaction and confidence in their assessments since AI's implementation. *"Employees have told us they appreciate the fact that AI helps remove biases. They feel more motivated, knowing that their performance is truly recognized based on what they deliver,"* stated one HR director.

These excerpts underscore the positive impact AI is having on fairness, transparency, and bias reduction in HR evaluations, as shared by leaders directly involved in these transformations. The employee also voiced support for AI-enhanced evaluations, noting that these systems helped mitigate favouritism and provided clear criteria for success, which improved their trust in the evaluation process. Technical experts, meanwhile, pointed out that AI's ability to remove identifiable information from evaluations allows HR teams to assess employee performance anonymously, further minimizing bias, they explained that AI tools can flag discrepancies, such as patterns where certain groups might be consistently rated lower, prompting HR leaders to investigate and address potential inequities, this shift towards a fairer, data-driven evaluation system is helping organizations build a more inclusive culture where employees feel their contributions are accurately recognized and rewarded.

AI's integration into HR systems has proven transformative in supporting employee development by identifying skill gaps and recommending personalized training modules. Modern AI-driven HR systems can analyze an employee's performance data and detect areas where they may need improvement, which allows for highly tailored

development plans. For instance, AI algorithms can assess patterns in an employee's productivity, task completion rates, or proficiency with certain skills and then suggest relevant training modules. This alignment between individual skill gaps and specific training resources ensures that employees receive targeted support, maximizing their growth potential and job satisfaction.

Contemporary research, such as the study by (Namperumal, Selvaraj, et al., 2022), supports this approach, indicating that AI-enhanced training programs lead to a 30-40% improvement in learning retention and skill application compared to traditional methods. AI's ability to create these adaptive learning paths benefits both employees and organizations: employees enjoy a customized learning experience that respects their unique development needs, while organizations benefit from a workforce that is continuously evolving and becoming more capable. Furthermore, tailored training programs encourage employees to engage in self-directed learning, as they receive direct feedback and actionable insights on areas for improvement, fostering a proactive approach to professional growth.

Impact on Data Security

AI-driven HR systems have introduced significant improvements in data security while also presenting specific risks that need careful management. Quantitative data from this study reveal that 45% of surveyed organizations identified potential risks such as data breaches or unauthorized access as primary concerns in adopting AI-powered HR tools. The implementation of advanced AI-based security solutions, such as multi-factor authentication (MFA) and anomaly detection systems, has effectively mitigated many of these risks. 40% of organizations reported successfully deploying AI-enabled intrusion detection systems, which demonstrated a 90% success rate in identifying and addressing anomalous activities before they could escalate into major security incidents.

Figure 5. Relationship between MFA adoption rate, anomaly detection rate, and improvement in data security (measured by the reduction in breaches)
Source: data proceed

The regression analysis shows that the relationship between MFA adoption rate, anomaly detection rate, and improvement in data security (measured by the reduction in breaches) has an **R-squared value of 0.063**, meaning the model explains only about 6.3% of the variation in the improvement. The anomaly detection rate has a significant negative coefficient (-0.5885, p = 0.017), indicating that higher anomaly detection rates tend to be associated with less improvement in reducing breaches. However, the MFA adoption rate doesn't appear to significantly affect improvement (p = 0.564). 50% of organizations surveyed indicated that incorporating MFA significantly enhanced access control, reducing unauthorized login attempts by 70% within the first year of implementation. These systems leverage AI to evaluate multiple factors—such as device fingerprints, behavioural biometrics, and geolocation—before granting access, creating an additional layer of protection against cyber threats. Similarly, anomaly detection systems are capable of monitoring vast volumes of login activity and system usage patterns, immediately flagging suspicious behaviour. Among organizations using these tools, 42% experienced a notable decrease in data breaches compared to those relying on traditional security measures.

These findings are consistent with the research of (Mohammed, 2020), who emphasized the role of AI in proactive risk mitigation, particularly in HR systems managing sensitive employee information. AI-powered tools not only detect and respond to security threats in real-time but also adapt to evolving cyberattack methods, making them indispensable for modern organizations. Experts warn that these systems are not infallible and must be complemented by robust policies and regular audits to ensure data integrity. These insights underscore the importance of prioritizing AI-driven security measures when adopting digital HR systems by implementing solutions like MFA and anomaly detection, organizations can safeguard sensitive data while maintaining employee trust. Moreover, the high success rates of these technologies suggest that further investments in AI-driven security innovations could yield even greater protection against increasingly sophisticated threats in the digital age.

Interviews with data security experts provided valuable perspectives on the challenges and opportunities AI brings to safeguarding sensitive HR data. Experts consistently highlighted concerns about data breaches, particularly in organizations transitioning to AI-powered HR systems. As one cybersecurity consultant in Semarang stated, *"The primary risk lies in the sheer volume of sensitive data HR systems handle—everything from payroll information to personal employee records. Without adequate safeguards, these systems become lucrative targets for attackers."*

Despite these risks, experts underscored the role of AI in mitigating threats through advanced detection and prevention mechanisms. AI-powered tools, such as anomaly detection systems, were praised for their ability to monitor real-time data flows and flag suspicious activities. A local IT manager from a multinational company in Semarang explained, *"AI doesn't just identify threats faster; it evolves with them. By analyzing past breaches, AI systems continuously refine their detection algorithms, making them more effective over time."* Best practices for enhancing security were also widely discussed. Experts in Semarang emphasized the importance of encryption protocols for protecting data at rest and in transit. One technical advisor noted, *"Encryption is the backbone of secure systems. Combined with AI's monitoring capabilities, it ensures that even if data is intercepted, it remains inaccessible without the proper decryption keys."*

Access control policies were another focal point. Interviewees highlighted the growing adoption of multi-factor authentication (MFA) and role-based access systems among organizations in Semarang. These measures limit data access to authorized individuals and reduce the risk of insider threats. A CHRO from a manufacturing firm remarked, *"Integrating MFA with AI has been a game-changer. AI continuously evaluates user behaviour, and if anomalies are detected, access can be immediately restricted."* These insights reveal a clear trajectory towards integrating AI as a critical component of data security in HR systems. While challenges remain, such as ensuring AI's ethical application and addressing potential vulnerabilities in the algorithms, the experts agree that AI-driven tools, when combined with robust encryption and strict access control, offer unparalleled protection against data breaches. Organizations in Semarang adopting these practices are setting a strong precedent for balancing technological advancement with security needs.

Several organizations have successfully integrated AI-driven HR systems to enhance data security while ensuring compliance with data protection regulations in Semarang, and these case studies offer practical examples of how AI can be leveraged to protect sensitive HR data without compromising legal and regulatory requirements. One notable example is Semarang Tech Solutions Ltd, a leading technology firm in the region, which deployed an AI-powered HR system to streamline recruitment and manage employee data. The company faced significant concerns regarding data breaches, particularly in the handling of personal and financial information. To address these risks, Semarang Tech Solutions Ltd implemented AI-driven anomaly detection systems that continuously monitored login activities and flagged any unusual access patterns. This AI system, combined with end-to-end encryption for all stored employee data, significantly reduced the risk of unauthorized access. According to the company's IT director, *"AI allows us to detect potential security threats in real-time, which is critical when managing sensitive HR data. Our encryption protocols, coupled with AI's monitoring, help us stay compliant with Indonesia's data protection regulations, particularly the PDP Law (Personal Data Protection Law)."*

Semarang General Hospital, a large healthcare provider in the region, faced challenges in protecting sensitive employee and patient information. The hospital adopted AI-powered multi-factor authentication (MFA) for HR system access. This decision was prompted by increasing concerns over insider threats and unauthorized access to confidential medical and employment records. By incorporating AI into their MFA process, the hospital could continuously analyze employee behaviour, ensuring that access was granted only to authorized personnel. *"AI-enhanced MFA has made a huge difference,"* said the hospital's Chief HR Officer. *"Not only does it provide an extra layer of protection, but it also ensures compliance with health data regulations such as HIPAA and local data protection laws."*

IndoBank Semarang, a regional banking institution, utilized AI to manage HR data securely while enhancing the efficiency of internal audits. With the increasing complexity of financial data management, IndoBank turned to AI-powered audit tools to detect discrepancies and potential security breaches within their HR systems. The bank implemented real-time threat detection and encryption for all employee records, which proved essential in preventing unauthorized data access. Furthermore, the AI system helped IndoBank maintain compliance with financial data protection regulations like Indonesia's Financial Services Authority (OJK) guidelines. According to the bank's security officer, *"We use AI not only for security but also to streamline compliance checks. Our AI system helps us ensure that our HR system complies with regulations while maintaining the highest standards of data protection."*

These case studies from Semarang demonstrate how AI-driven HR systems can successfully balance enhancing security with compliance to data protection regulations. By leveraging AI in various ways—from anomaly detection to multi-factor authentication—organizations in Semarang are setting a benchmark for effectively managing HR data security while adhering to the legal and ethical standards required in the digital age.

Comparison with Traditional HR Systems

We compare the performance and efficiency of traditional HR systems versus AI-driven HR systems in terms of key HR functions such as recruitment and performance reviews. The focus is on how AI adoption can streamline operations, reduce time and resource costs, and improve overall efficiency in comparison to legacy systems. One of the key areas where AI-driven HR systems show a distinct advantage over traditional systems is in the time and resources required to complete essential HR functions. Traditional HR systems, often characterized by manual processes and reliance on paper-based documentation, are typically more time-consuming and resource-intensive.

Performance evaluations in traditional systems are often reported to take approximately 30% longer than those in AI-driven systems. This delay is primarily due to the manual process of gathering performance data, scheduling meetings, and reviewing feedback from multiple stakeholders. AI-enabled systems can automate much of this process, including data collection, feedback analysis, and even suggesting areas for improvement. As a result, the evaluation process becomes significantly more efficient. In a survey conducted with HR professionals in Semarang, 68% of respondents noted that AI-powered systems were able to shorten the time spent on performance evaluations by up to 40%. One HR manager at Semarang Logistics Ltd. shared, *"With AI, we don't have to manually compile feedback from managers and peers. The system aggregates everything in real-time and even suggests performance trends, helping us complete evaluations much faster and more accurately."*

Another key function that benefits from AI is recruitment. Traditional recruitment processes are often hindered by time-consuming manual screenings of resumes, long interview schedules, and the risk of human bias in candidate selection. Traditional recruitment processes in Semarang organizations were reported to take around 35% longer than AI-driven recruitment systems, which can screen applications, rank candidates, and even schedule interviews without human intervention. Semarang Innovations Ltd, a software company, reduced its recruitment cycle by 25% after adopting AI tools to automate initial candidate screenings and assessments. As the HR director of the company noted, *"AI is a game-changer in recruitment. It helps us identify the most suitable candidates much faster, freeing up our HR team to focus on strategic tasks like onboarding and employee development."*

AI-driven systems also contribute to more efficient resource allocation. In traditional HR systems, significant time is spent on manual data entry, paperwork, and administrative tasks, which can result in HR teams being stretched thin. AI technologies can automate these routine tasks, allowing HR professionals to focus on more value-added activities such as strategic workforce planning and talent management, over 50% of HR personnel reported that they could allocate their time to higher-value activities, such as employee development and strategic decision-making, as opposed to administrative duties in organizations that have adopted AI in Semarang. A senior HR analyst at Semarang Healthcare Solutions remarked, *"With AI taking over administrative tasks like payroll and attendance tracking, our HR staff can now focus on employee well-being and long-term organizational goals."* Security is paramount, especially when handling sensitive employee data such as personal details, performance records, and payroll information. Traditional HR systems often rely on static security measures, while AI-driven systems introduce dynamic and more sophisticated methods to enhance security. This section compares the security measures used by traditional HR systems versus AI-powered HR systems, highlighting the advantages of AI in maintaining robust data protection.

Traditional HR systems typically rely on static security protocols, such as password-based authentication and manual audits to protect sensitive data. Password-based security has long been the default for securing access to HR

systems. However, password systems are increasingly vulnerable due to several factors, including weak password practices, the reuse of passwords across platforms, and the risk of password theft. Traditional systems often lack the real-time monitoring capabilities necessary to detect and respond to potential security threats promptly. Manual audits are another common security practice in traditional systems, these audits involve reviewing system logs and employee access records to identify suspicious activity, while effective to some extent, manual audits are time-consuming, prone to human error, and typically reactive rather than proactive, this approach can result in delays in identifying breaches or unauthorized access, leaving the system vulnerable to threats for longer periods.

AI-driven HR systems provide dynamic security measures that go beyond static protocols. One of the key advantages of AI is its ability to provide real-time monitoring and predictive analytics, which significantly improve the system's ability to detect and respond to security threats proactively. AI can continuously monitor user activities, such as login attempts, data access patterns, and unusual system behaviour. When AI detects anomalies—such as multiple failed login attempts or access from unfamiliar locations—it can immediately trigger alerts and even take corrective actions, such as temporarily locking the account or requiring additional authentication measures (e.g., multi-factor authentication). AI systems can use predictive analytics to anticipate potential security breaches before they occur. By analyzing historical data and identifying patterns in user behaviour, AI can predict which employees or system activities may pose a security risk. This allows HR teams to take preventive measures, such as restricting access to certain sensitive data or flagging specific employees for additional security checks. The proactive nature of AI security measures helps organizations stay one step ahead of potential threats, unlike traditional systems, which may only react after a breach has occurred.

AI-driven security measures have several key advantages over traditional static security measures:

1. Real-Time Monitoring: AI can track system activity continuously, providing real-time alerts when suspicious behaviour is detected. This helps identify security threats as they occur, allowing organizations to take immediate action.
2. Predictive Analytics: AI can analyze large datasets and identify trends that may indicate potential security risks, allowing organizations to take preventive action before breaches happen.
3. Automated Response: In many cases, AI can automatically respond to security threats, such as locking accounts or enforcing multi-factor authentication, without requiring human intervention.
4. Reduced Human Error: Traditional systems rely on manual audits and human judgment, which are prone to errors and delays. AI can process vast amounts of data quickly and accurately, reducing the likelihood of overlooking security risks.

While traditional HR systems rely on static security measures like passwords and manual audits, AI-powered HR systems provide dynamic and more advanced security capabilities, through real-time monitoring, predictive analytics, and automated responses, AI enhances the ability to detect and prevent security threats, ensuring that sensitive employee data is better protected, as organizations continue to face increasing cybersecurity challenges, AI offers a more effective and proactive approach to data security compared to traditional methods. Employee experience is a crucial factor in organizational success, particularly in the context of HR systems. Fairness, transparency, and responsiveness are key elements that shape employees' perceptions of their work environment and influence their overall satisfaction and engagement. This section compares how employees perceive these aspects in traditional HR systems versus AI-enhanced systems, highlighting the benefits of AI in improving the employee experience (Charlwood & Guenole, 2022; Yanamala, 2024b).

Employees tend to perceive AI-driven systems more favourably in terms of fairness, transparency, and responsiveness when comparing traditional and AI-enhanced systems. Studies show that when AI is used to manage performance evaluations or recruitment processes, employees report higher levels of satisfaction due to the consistency and objectivity of AI systems. For instance, a survey by Deloitte (2019) found that 76% of employees in AI-enhanced workplaces believed that AI increased transparency in decision-making, while 68% felt that AI made the workplace more fair. In terms of responsiveness, AI-driven systems have the edge due to their ability to provide real-time feedback and facilitate instant communication. Employees who received immediate feedback from AI systems were more likely to feel valued and engaged, as opposed to waiting for periodic performance reviews or feedback from managers in traditional systems. AI-enhanced HR systems significantly improve employee perceptions of fairness, transparency, and responsiveness compared to traditional systems. AI's ability to eliminate biases in decision-making, provide clear and consistent feedback, and respond in real-time enhances the overall employee experience. As organizations continue to adopt AI in their HR processes, employees are likely to benefit

from a more equitable, transparent, and responsive work environment, which can lead to higher satisfaction and engagement(Aderamo et al., 2024; Boehmer & Schinnenburg, 2023).

Implications for Organizations

As organizations increasingly adopt AI-driven HR systems, it is essential to understand the practical implications of these changes for the workforce and the organization as a whole. While AI has the potential to significantly enhance HR functions, organizations must approach implementation carefully to maximize the benefits while mitigating risks, we provide actionable recommendations for organizations considering the adoption of AI in HR, emphasizing a strategic and phased approach to implementation, as well as the importance of training employees and HR professionals.

One of the key recommendations for organizations considering AI adoption in HR is to start with a phased approach. AI should be implemented in less complex, routine HR functions that do not require highly subjective decision-making. AI can be used to automate scheduling, payroll processing, or benefits administration. These functions tend to involve clear rules and processes, making them ideal candidates for automation through AI. By starting with these less complex tasks, organizations can gain experience with AI systems, refine their implementation strategies, and assess the technology's effectiveness without introducing significant risks. Once organizations have successfully integrated AI into these simpler functions, they can gradually expand its use to more complex HR tasks, such as recruitment, performance evaluations, and employee development. This approach minimizes potential disruptions to existing workflows and allows the HR team to build confidence in the technology before relying on it for critical decision-making processes.

Both employees and HR professionals must be trained to use the systems effectively for AI adoption to be successful. AI tools may be sophisticated, but their success depends largely on how well they are understood and utilized by the people interacting with them. HR professionals must be trained to interpret AI-generated insights, ensure ethical use of data, and understand the limitations of AI systems. This includes developing skills to troubleshoot and adjust AI systems when necessary, and ensuring that HR staff can use the technology to support their decision-making processes rather than relying solely on the machine (Malik et al., 2022; Popo-Olaniyan et al., 2022b).

Employees should be educated on how AI impacts their experience, including how AI is used for performance evaluations, feedback, and career development. Clear communication about the role of AI and its benefits will help to foster trust and acceptance among the workforce. Organizations should also provide continuous support and training to keep employees updated on new AI capabilities and tools. As AI systems rely on vast amounts of employee data, organizations must ensure that data privacy and security are maintained throughout the implementation process. Establishing clear policies for data collection, storage, and usage is essential to protect employee information and comply with legal and regulatory requirements. Organizations should also implement ethical guidelines to ensure that AI systems do not reinforce biases or unfair practices. Regular audits of AI systems should be conducted to identify any unintended consequences or biases in the decision-making process. Successful AI implementation in HR requires close collaboration between HR professionals and IT teams. HR leaders must work with IT specialists to ensure that AI systems are properly integrated with existing HR software and data systems. This collaboration can also help to ensure that AI tools are scalable, secure, and aligned with the organization's goals. Additionally, IT teams can assist in troubleshooting and maintaining AI systems, while HR professionals can provide insights into the practical needs and challenges of managing human capital (Yanamala, 2024a; Yaseen, 2022).

After implementing AI-driven HR systems, organizations should continuously monitor the performance of these systems and gather feedback from employees and HR professionals. This feedback loop will help organizations identify areas where AI is delivering value and areas where improvements are needed. If employees report dissatisfaction with an AI-driven performance evaluation tool, HR professionals should investigate the issue, make necessary adjustments, and ensure that the system is fair and transparent. Regular monitoring and adjustments will also help to address any technical glitches or limitations that could undermine the effectiveness of AI tools. While AI-driven HR systems offer significant potential to improve organizational efficiency and employee experience, their successful adoption requires careful planning and execution, ensuring data privacy and ethical standards, fostering collaboration between HR and IT, and continuously monitoring system performance, organizations can harness the full benefits of AI while minimizing risks by investing in training. These practical recommendations provide a roadmap for organizations looking to navigate the complexities of AI adoption and integrate these technologies effectively into their HR functions.

Conclusion

This study highlights the significant role of AI in enhancing employee performance and improving data security within HR systems. Key findings indicate that AI contributes to greater administrative efficiency, real-time feedback, and personalized employee development, while also offering advanced solutions for data security, such as anomaly detection and multi-factor authentication. However, the study is limited by its focus on a specific sample of organizations and the potential for data bias, particularly in subjective areas like employee perception. Future research could explore the broader impact of AI across various HR functions, such as recruitment and employee engagement, and further investigate the development of AI systems with more robust security features to address emerging data privacy concerns.

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