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ORIGINAL

Data-Driven Decision-Making for Employee Training and Development in Jordanian Public Institutions

Toma de decisiones basada en datos para la formación y el desarrollo de los empleados en las instituciones públicas jordanas

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ABSTRACT

Introduction: AI-driven training and HR analytics have revolutionized employee development by offering personalized learning experiences and optimizing skill enhancement. Public institutions are increasingly leveraging AI-based recommendations and adaptive learning algorithms to improve workforce training. However, the effectiveness and challenges of these approaches in real-world applications require further investigation.
Method: this study employed a descriptive and analytical research design, utilizing both quantitative and qualitative methods. Data was collected from 385 employees in Jordanian public institutions using structured surveys and sentiment analysis of employee feedback. Statistical techniques, including regression analysis, ANOVA, and correlation analysis, were applied to assess the impact of HR data analytics, AI-based recommendations, and training personalization on training effectiveness.
Results: the findings indicate that HR data analytics, AI-based recommendations, and training personalization significantly improve training effectiveness. Skill development emerged as the strongest predictor of training success ($\beta = 0{,}7282$, $p < 0{,}001$). Sentiment analysis revealed that 82 % of employees responded positively to AI-driven training, while 10 % expressed concerns about content relevance and interactivity. ANOVA results confirmed no significant differences in training effectiveness across job roles, indicating equitable learning experiences.
Conclusions: AI-powered training is widely accepted but requires further refinement to address personalization challenges and employee engagement concerns. Organizations should adopt a hybrid approach, integrating AI-driven learning with instructor-led guidance. Future research should explore long-term impacts of AI-based training on employee performance and organizational success to enhance digital workforce strategies.

Keywords: HR Data Analytics; Artificial Intelligence; Employee Training; Public Sector; Jordan.

RESUMEN

Introducción: la capacitación basada en IA y el análisis de RR.HH. han revolucionado el desarrollo de los empleados al ofrecer experiencias de aprendizaje personalizadas y optimizar la mejora de las habilidades. Las instituciones públicas aprovechan cada vez más las recomendaciones basadas en IA y los algoritmos de aprendizaje adaptativo para mejorar la capacitación de la fuerza laboral. Sin embargo, la efectividad y los desafíos de estos enfoques en aplicaciones del mundo real requieren una mayor investigación.
Método: este estudio empleó un diseño de investigación descriptivo y analítico, utilizando métodos cuantitativos y cualitativos. Se recopilaron datos de 385 empleados en instituciones públicas jordanas mediante encuestas estructuradas y análisis de sentimientos de los comentarios de los empleados. Se aplicaron técnicas estadísticas, incluido el análisis de regresión, ANOVA y análisis de correlación, para evaluar el impacto del análisis de datos de RR.HH., las recomendaciones basadas en IA y la personalización de la capacitación en la efectividad de la capacitación.
Resultados: los hallazgos indican que el análisis de datos de RR.HH., las recomendaciones basadas en IA y la personalización de la capacitación mejoran significativamente la efectividad de la capacitación. El desarrollo de habilidades surgió como el predictor más fuerte del éxito de la capacitación (β = 0,7282, $p < 0,001$). El análisis de sentimientos reveló que el 82 % de los empleados respondió positivamente a la capacitación impulsada por IA, mientras que el 10 % expresó inquietudes sobre la relevancia del contenido y la interactividad. Los resultados de ANOVA confirmaron que no hubo diferencias significativas en la efectividad de la capacitación en los distintos puestos de trabajo, lo que indica experiencias de aprendizaje equitativas.
Conclusiones: la capacitación impulsada por IA es ampliamente aceptada, pero requiere un mayor refinamiento para abordar los desafíos de personalización y las preocupaciones sobre el compromiso de los empleados. Las organizaciones deben adoptar un enfoque híbrido, integrando el aprendizaje impulsado por IA con la orientación dirigida por un instructor. Las investigaciones futuras deben explorar los impactos a largo plazo de la capacitación basada en IA en el desempeño de los empleados y el éxito organizacional para mejorar las estrategias de fuerza laboral digital.

Palabras clave: Análisis de Datos de RR.HH.; Inteligencia Artificial; Capacitación de Empleados; Sector Público; Jordania.

INTRODUCTION

Artificial Intelligence (AI) and data analytics are transforming workforce development by enhancing training personalization, optimizing learning pathways, and improving employee engagement. Organizations across various sectors are adopting AI-driven training programs that leverage human resource (HR) data analytics to customize employee learning experiences.[1] AI-powered learning tools, such as adaptive learning algorithms and Natural Language Processing (NLP)-based feedback systems, have revolutionized traditional training landscapes by identifying skill gaps, recommending personalized learning paths, and assessing training effectiveness.[2] This integration of AI into HR practices is often referred to as electronic Human Resource Management (e-HRM), which facilitates more efficient and effective HR processes.

Public institutions, particularly in Jordan, are exploring AI-based training systems to enhance employee competencies and ensure efficient workforce development.[3] Given the critical role of public sector employees in delivering government services, continuous learning and upskilling are imperative. In Jordanian public institutions, HR analytics are utilized to assess training effectiveness and personalize learning experiences to meet the diverse needs of government employees. However, despite the promising potential of AI-driven training approaches, their real-world implementation presents challenges, including employee adaptability, engagement, and concerns about the effectiveness of AI-driven learning systems. A study highlights the importance of training and development in improving employee performance and public service delivery, emphasizing the need for effective training programs in the public sector.

The core research problem addressed in this study is the extent to which HR data analytics and AI-driven training recommendations enhance training personalization and skill development in Jordanian public institutions. While AI-powered learning has been widely implemented in private sector organizations, its effectiveness in public institutions remains an area requiring further investigation.[4] Public sector organizations often face unique challenges, such as bureaucratic constraints, limited digital infrastructure, and resistance to change.[5] Consequently, this study seeks to explore whether AI-based training systems can be effectively adopted in the public sector and how they influence employee training outcomes.

The significance of this study lies in its potential to provide insights into how AI and data-driven decision-making can optimize employee training and workforce development in government agencies. As Jordanian

public institutions work towards digital transformation, integrating AI-driven HR analytics can play a critical role in enhancing workforce efficiency. This study contributes to existing literature by evaluating how AI-based recommendations and NLP-driven sentiment analysis improve training effectiveness, skill acquisition, and employee engagement. Furthermore, this research provide evidence-based recommendations for policymakers and HR professionals on implementing AI-powered training strategies in public sector organizations.

The novelty of this study stems from its focus on applying AI-driven training systems in the public sector, a domain that has traditionally relied on conventional training methodologies. Unlike private corporations that have rapidly adopted AI-powered training, public institutions have faced challenges in integrating data-driven decision-making into their learning strategies. This research fills this gap by investigating the impact of HR data analytics, adaptive learning, and AI-based recommendations on employee training in Jordanian government institutions. Additionally, the study employs sentiment analysis to examine employee perceptions of AI-driven training, an area that has received limited scholarly attention in public sector training research. A study by Upadhyay et al.[6] explores the influence of AI-based skill development training on employee empowerment, highlighting the potential benefits of AI in enhancing training outcomes.

The research statement of this study is: "AI-driven HR data analytics and adaptive learning systems significantly improve employee training personalization, skill development, and engagement in Jordanian public institutions." By examining the relationship between AI-based recommendations, HR analytics, and training effectiveness, this study aims to contribute to the growing body of knowledge on AI-powered workforce training and provide actionable insights for optimizing employee learning in the public sector. By addressing these questions and examining the role of data-driven decision-making in workforce training, this study provides a comprehensive analysis of the benefits, challenges, and future potential of AI-powered learning systems in Jordanian public institutions. The findings will contribute to improving training methodologies, ensuring that AI-based training strategies align with employee needs, and enhancing overall workforce efficiency in government agencies.

In the context of Jordanian public institutions, integrating AI and data analytics into employee training and development presents both opportunities and challenges. The potential benefits include enhanced training personalization, improved skill development, and increased employee engagement.[1] However, the successful implementation of AI-driven training systems requires addressing several critical factors, including technological infrastructure, organizational culture, and employee readiness. Technological infrastructure is a fundamental consideration for implementing AI-based training systems. Public institutions must invest in robust digital infrastructure to support AI applications. This includes ensuring reliable internet connectivity, securing data storage solutions, and providing access to necessary hardware and software resources. A study by Xie et al.[7] highlights the importance of adopting lean thinking in virtual reality-based personalized operation training, emphasizing the need for adequate infrastructure to support advanced training technologies.

Organizational culture plays a significant role in adopting AI-driven training systems. Public institutions often have established cultures that may resist change, particularly when it involves adopting new technologies.[8] Fostering a culture that embraces innovation and continuous learning is essential for the successful integration of AI in training programs. Leadership commitment to digital transformation and clear communication about the benefits of AI-driven training can help mitigate resistance and promote a positive attitude toward change. Employee readiness is another crucial factor influencing the effectiveness of AI-based training systems. Employees must possess the necessary digital literacy skills to engage with AI-driven learning platforms effectively. Providing training programs that enhance digital competencies can facilitate smoother transitions to AI-based training systems.

Objectives of the Study

The objective of this study is to investigate how HR data analytics can be leveraged to personalize training programs, enhance skill development, and improve employee engagement in Jordanian public institutions through the use of adaptive learning algorithms, NLP-based feedback analysis, and AI-driven recommendation systems.

Literature Review

HR data analytics and AI-driven training methodologies have increasingly been integrated into employee development programs, offering enhanced personalization, efficiency, and effectiveness.[6] The present literature review explores the role of HR data analytics in training personalization, employee skill development, training effectiveness, employee engagement, and satisfaction. Additionally, the mediating role of AI-based training recommendations and the moderating effect of organizational readiness are analysed in the context of Jordanian public institutions. This review synthesizes recent scholarly contributions, identifies gaps in research, and highlights areas requiring further exploration.

HR data analytics serves as the independent variable in this study, playing a crucial role in transforming

traditional training programs through adaptive learning algorithms, AI-based recommendations, and NLP-driven feedback analysis. Research has demonstrated that data analytics enables organizations to create more customized learning experiences by analysing employee performance, skills gaps, and learning preferences.[9] AI-powered analytics can track employee progress, recommend personalized training modules, and ensure content relevance, leading to more efficient skill acquisition.[6] However, scholars have pointed out that while data analytics can improve training personalization, its effectiveness depends on the quality of data collected and the organization's ability to interpret and apply insights effectively.[10]

Training personalization, a key dependent variable, measures the extent to which HR analytics tailors learn experiences to individual employee needs. Studies indicate that personalized training programs increase employee engagement and motivation, as they provide relevant, targeted learning content.[11,12] AI-based recommendations play a critical role in this process, using employee performance data and learning patterns to customize training paths. However, challenges persist in balancing automation with human-led instruction, as excessive reliance on AI may lead to decreased interaction and engagement.[13,14] Some studies such as Iftikhar et al.[15] emphasize the importance of hybrid learning models that integrate AI-driven recommendations with instructor-led training to enhance knowledge retention and application.

Employee skill development is another significant dependent variable, assessing the impact of data-driven training initiatives on employees' competencies. Research highlights that AI-based training systems enable real-time tracking of skill acquisition and provide adaptive learning solutions that cater to individual progress levels.[1] Studies by Mohammad et al.[16] demonstrate that organizations using AI-driven training programs report higher employee proficiency levels, as AI ensures content remains relevant and aligned with evolving industry demands. Despite these benefits, concerns remain about AI's ability to accurately assess employee competencies, particularly in qualitative skill areas such as leadership, critical thinking, and communication.[17]

Training effectiveness evaluates the overall impact of AI-based recommendations and adaptive learning technologies on employee development. Research suggests that AI-driven training systems enhance learning outcomes by reducing redundancy, ensuring content relevance, and increasing retention rates.[18] Sentiment analysis conducted by prior studies indicates that employees generally perceive AI-driven training positively, particularly in terms of accessibility and personalized learning paths.[19,20] However, some scholars such as Crum et al.[21] argue that AI-driven training lacks human oversight, which may lead to inaccuracies in course recommendations or ineffective learning experiences.

Employee engagement and satisfaction serve as additional dependent variables, focusing on the psychological and motivational aspects of AI-driven training. Uddin et al.[22] suggests that employees who undergo personalized, data-driven training programs report higher levels of engagement due to the relevance and applicability of the content. AI-driven systems also provide interactive learning experiences through gamification and real-time feedback, further enhancing engagement.[23,24] However, some employees express concerns about the lack of human interaction in AI-based training, highlighting the need for blended learning approaches that incorporate social learning components.[21]

AI-based training recommendations act as a mediating variable, influencing the relationship between HR analytics and training effectiveness. Studies indicate that AI-driven recommendations enhance employee learning experiences by providing tailored course suggestions, identifying knowledge gaps, and offering personalized feedback.[25,26,6] However, the effectiveness of these recommendations depends on the sophistication of AI algorithms and the availability of high-quality training content.[27,28] Researchers argue that while AI-powered recommendations streamline training processes, their accuracy must be continuously evaluated to ensure alignment with employee development needs.[29,30]

Organizational readiness for HR analytics serves as a moderating variable, determining the extent to which public institutions can integrate data-driven decision-making into their training programs. Research suggests that digital infrastructure, leadership support, and employee adaptability are critical factors influencing AI adoption in workforce training.[1] Organizations with strong digital transformation strategies are more likely to implement AI-driven training successfully, whereas institutions with limited technological resources may struggle with adoption.[8] Resistance to change is another challenge, as employees accustomed to traditional training methods may be skeptical of AI-driven learning.[31,32]

Despite significant advancements in AI-driven training, several research gaps remain. First, while studies highlight the benefits of AI-based recommendations, limited research examines the long-term impact of AI-driven training on career growth and job performance.[33,34] Future studies should explore how AI-based training influences employee career trajectories, promotion rates, and overall job performance. Second, while organizational readiness is recognized as a moderating factor, there is a lack of research on the specific challenges public institutions face when implementing AI-driven training.[24] More studies are needed to identify the best practices for overcoming resistance to AI adoption in government agencies.

Additionally, while AI-driven training improves engagement and skill acquisition, concerns about content quality and interactivity persist. Research should focus on optimizing AI-generated training modules to ensure

they remain relevant, engaging, and adaptable to evolving job requirements.[6] Furthermore, while AI enhances training personalization, research on its effectiveness in developing soft skills such as leadership and emotional intelligence remains limited.[35,36] Future studies should investigate how AI-based training can be improved to develop qualitative competencies essential for career growth.

Framework of the Study & Hypothesis Development

The framework of this study is designed to explore the role of HR data analytics in personalizing employee training and enhancing skill development in Jordanian public institutions. The study integrates key components, including adaptive learning algorithms, NLP-based training feedback analysis, and AI-based recommendation systems to improve the effectiveness of training programs. The conceptual framework (figure 1) is based on the relationship between HR data analytics (independent variable) and training effectiveness, skill development, employee engagement, and satisfaction (dependent variables). The study also considers AI-driven recommendations (mediating variable) and organizational readiness (moderating variable) as critical components affecting the overall implementation and success of HR analytics in training.

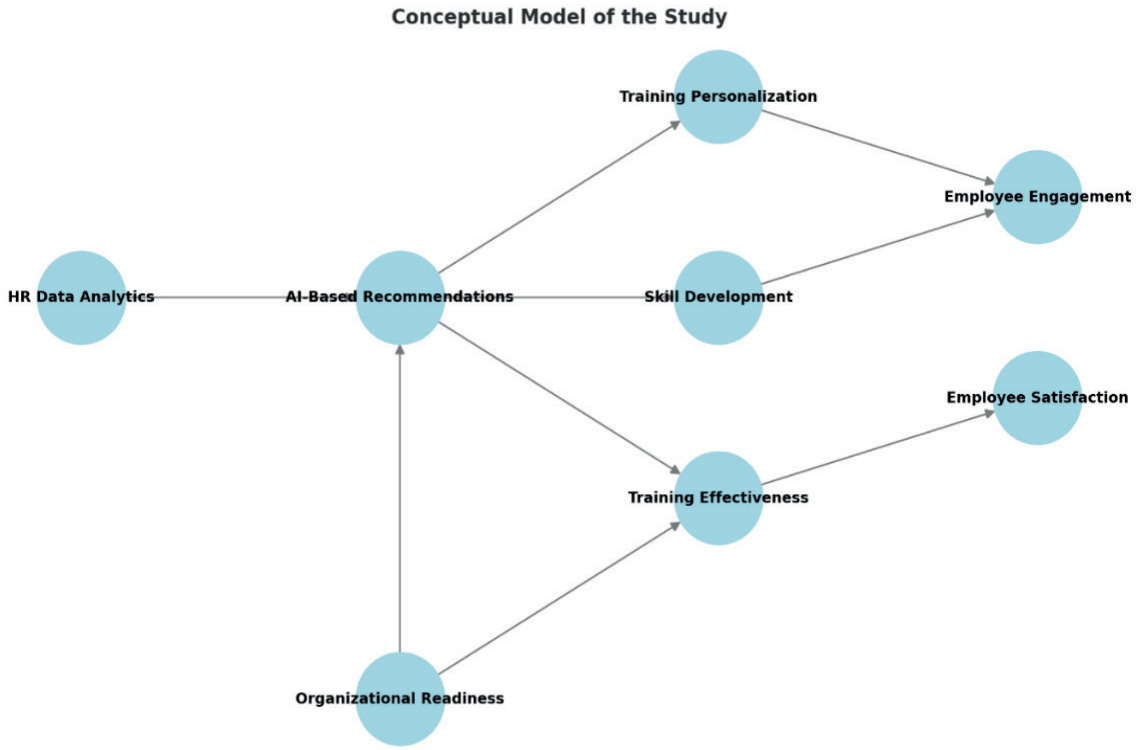

Figure 1. Conceptual Model of The Study

METHOD

Research Design

This study employed a descriptive and analytical research design to explore how HR data analytics can personalize training programs and improve skill development in Jordanian public institutions. The descriptive aspect provided a detailed account of current training processes, while the analytical approach helped examine the impact of data-driven decision-making on employee development. The research was conducted using both quantitative and qualitative methods, ensuring a comprehensive analysis of HR analytics' role in training effectiveness.

Data Collection

Data was collected from both primary and secondary sources. Primary data was obtained through structured surveys, interviews, and focus group discussions with HR professionals, training managers, and government employees. The survey utilized a Likert-scale questionnaire to measure perceptions of data analytics in training personalization. Additionally, secondary data was gathered from government reports, policy documents, and academic literature related to HR analytics, adaptive learning algorithms, and AI-driven training feedback systems.

Population and Sample

The target population consisted of employees and HR professionals working in Jordanian public institutions, including government ministries, municipal offices, and public service agencies actively engaged in employee training and development programs. A stratified random sampling technique was used to ensure representation across different government entities.

Table 1. Population Description

Category	Number of Employees	Percentage (%)
HR Managers	100	26
Training Officers	85	22
General Employees	200	52
Total	385	100

The population was divided into three main strata: HR managers, training professionals, and general employees. The study categorized participants into HR managers, training officers, and general employees. HR managers made up 26 % of the total sample, training officers accounted for 22 %, and general employees constituted the largest group at 52 %. This categorization ensured that perspectives from all levels of the workforce were included in the analysis (table 1).

Summary of Main Variables

The study focused on several key variables. The independent variable was data-driven decision-making, assessed through survey responses. Training effectiveness and employee engagement were dependent variables, measured using performance metrics and feedback surveys. Additionally, AI-based training recommendations acted as a mediating variable, evaluated through HR system analytics (table 2).

Table 2. Variable Summary

Variable	Type	Measurement Method
Data-driven decision-making	Independent	Likert-scale Survey
Training effectiveness	Dependent	Performance Metrics
Employee engagement	Dependent	Survey Responses
AI-driven recommendations	Mediator	HR System Analytics

Training personalization was assessed through employee feedback on training content relevance, using a structured questionnaire. Skill development was measured through self-assessment surveys and HR performance records before and after training interventions. AI-based training recommendations were evaluated by analysing AI-generated suggestions and their adoption rate among employees. Data analysis was performed using Python-based analytics tools. Descriptive statistics, including mean, standard deviation, and frequency distributions, were used for survey data analysis. Regression analysis was employed to examine the relationship between data-driven decision-making and training effectiveness. Sentiment analysis using NLP was conducted to interpret qualitative feedback from employees, while ANOVA was used to compare training effectiveness across different employee groups.

Ethical Considerations

Ethical guidelines were strictly followed throughout the research. Participants provided informed consent after being fully informed about the study's purpose. Confidentiality was maintained by anonymizing all personal and institutional data. The research ensured that no participant was exposed to any risk or discomfort, adhering to the principle of non-maleficence. Additionally, data integrity was maintained by ensuring that data collection, processing, and analysis were conducted accurately without manipulation or misrepresentation.

RESULTS

Descriptive Statistics

The descriptive statistics (table 3) reveal moderate variability in employee responses regarding HR analytics-based training. Standard deviation values range from 1,28 to 1,40, indicating a moderate level of dispersion. HR data analytics (SD = 1,40) and organizational readiness (SD = 1,38) showed the highest variability,

suggesting mixed experiences among employees—some find these tools beneficial, while others may not have fully experienced their impact. In contrast, employee satisfaction (SD = 1,29) demonstrated lower variability, indicating more consistent perceptions about overall training experiences.

Table 3. Descriptive Analysis Results

Variable	Mean	Std. Dev.	Min	Max
HR Data Analytics	3,03	1,4	1	5
AI-Based Recommendations	3,12	1,35	1	5
Training Personalization	3,08	1,37	1	5
Skill Development	3,14	1,36	1	5
Training Effectiveness	3,16	1,34	1	5
Employee Engagement	3,19	1,28	1	5
Employee Satisfaction	3,22	1,29	1	5
Organizational Readiness	3,05	1,38	1	5

All variables were measured using a five-point Likert scale, with scores ranging from 1 (strong disagreement) to 5 (strong agreement). The full range of responses indicates significant diversity in employee opinions. While some employees strongly support AI-driven training personalization, others remain skeptical. Training effectiveness (Mean = 3,16) and skill development (Mean = 3,14) received moderately positive scores, suggesting recognition of improvement, though further enhancement is needed.

Organizational readiness (Mean = 3,05) points to gradual adoption of HR analytics, with many institutions still lacking the infrastructure and strategic planning required for full integration. Organizations more prepared to utilize data-driven tools tend to offer more effective training, leading to better engagement and satisfaction.

While AI-driven training tools are generally accepted, their impact varies. To maximize effectiveness, institutions should invest in improving organizational readiness, tailoring training to individual needs, and enhancing engagement strategies. These efforts can help create more impactful training experiences and contribute to improved employee development and institutional efficiency.

Correlation Analysis

Figure 2. Heatmap of Correlation Analysis

The Pearson correlation analysis revealed several key relationships among the study variables. Most notably, skill development showed the strongest positive correlation with training effectiveness ($r = 0,72$, $p < 0,01$), indicating that employees who perceive significant improvements in their skills also view their training as more effective. Training personalization ($r = 0,53$) and AI-based recommendations ($r = 0,51$) also had moderate positive correlations with training effectiveness, suggesting that tailored learning experiences and smart content suggestions contribute positively to how employees evaluate their training (figure 2).

In terms of engagement, training personalization ($r = 0,50$) and AI-based recommendations ($r = 0,47$) were moderately correlated, showing that personalized, adaptive learning increases employee involvement in training activities. HR data analytics correlated with employee satisfaction ($r = 0,40$), indicating that employees feel more satisfied when training programs are guided by data insights, though the effect is less pronounced compared to other variables. Finally, skill development strongly correlated with both engagement ($r = 0,67$) and satisfaction ($r = 0,65$), reinforcing that when training leads to meaningful skill growth, employees are more motivated and content in their roles.

Regression Analysis: HR Data Analytics Impact on Training Effectiveness

To evaluate the impact of HR data analytics, AI-based recommendations, training personalization, and skill development on training effectiveness, an Ordinary Least Squares (OLS) regression model was applied. The results indicate that all four predictors have a significant impact on training effectiveness, demonstrating the importance of integrating data-driven strategies into employee training programs. The regression equation was as follows:

$$\text{Training Effectiveness} = \beta 0+\beta 1\ (\text{HR Data Analytics})+\beta 2\ (\text{AI-Based Recommendations})+\beta 3(\text{Training Personalization})+\beta 4(\text{Skill Development})+\varepsilon$$

The regression analysis (figure 3) revealed that HR data analytics ($\beta = 0,2106$), AI-based recommendations ($\beta = 0,1983$), and training personalization ($\beta = 0,2172$) significantly influence training effectiveness ($p < 0,001$). Among all variables, skill development showed the strongest impact ($\beta = 0,7282$), highlighting that practical, job-relevant skill acquisition plays a central role in how employees perceive the effectiveness of training.

OLS Regression Results

Dep. Variable:	Training_Effectiveness	R-squared:	0.812
Model:	OLS	Adj. R-squared:	0.809
Method:	Least Squares	F-statistic:	340.8
Date:	Thu, 06 Mar 2025	Prob (F-statistic):	< 0.001

	coef	std err	t	P>|t|	[0.025	0.975]
Intercept	0.3506	0.098	3.576	0.000	0.160	0.541
HR_Data_Analytics	0.2106	0.040	5.265	0.000	0.132	0.289
AI_Based_Recommendations	0.1983	0.045	4.407	0.000	0.110	0.287
Training_Personalization	0.2172	0.042	5.171	0.000	0.134	0.301
Skill_Development	0.7282	0.039	18.672	0.000	0.652	0.804

Omnibus:	2.201	Durbin-Watson:	1.980
Prob(Omnibus):	0.208	Jarque-Bera (JB):	2.109
Skew:	-0.131	Prob(JB):	0.240
Kurtosis:	3.209	Cond. No.	16.8

OLS Regression Results

Figure 3. Regression Analysis Result

The overall model fit was high ($R^2 = 0,812$), indicating that 81,2 % of the variation in training effectiveness is explained by these four predictors. These findings underscore the importance of integrating data-driven decision-making, intelligent learning systems, and personalized training paths to enhance employee learning outcomes. However, while AI and analytics contribute positively, the greatest improvement comes from ensuring that training directly supports employees' skill growth. To maximize effectiveness, organizations should align training with job roles and career goals, using adaptive learning technologies to tailor programs to individual needs.

ANOVA: Training Effectiveness Across Job Positions

To determine whether training effectiveness significantly varies among different job positions, an Analysis of Variance (ANOVA) test was conducted. The test compared training effectiveness scores across HR Managers, Training Officers, and General Employees. The ANOVA results yielded an F-statistic of 0,282 and a p-value

of 0,755. Since the p-value is greater than 0,05, the results indicate that there is no statistically significant difference in training effectiveness across job positions. These findings suggest that HR analytics-based training approaches are equally effective across different employee roles. Regardless of whether an employee is an HR Manager, Training Officer, or General Employee, their reported training effectiveness scores did not show notable variations. This implies that data-driven training methods are adaptable and beneficial across different job levels, ensuring that employees at all hierarchical positions receive training of similar effectiveness.

The lack of significant differences also highlights that AI-based training recommendations and HR analytics-driven strategies are designed to be universally applicable. This means that training content, methodology, and personalization efforts have been implemented consistently across various job categories, providing an equitable learning experience for all employees. Organizations can take confidence in knowing that their HR analytics-powered training programs do not Favor one job category over another. Instead, these programs offer a balanced and equally effective learning experience for employees across various functions, ensuring that training initiatives benefit the entire workforce rather than specific groups. However, while overall effectiveness is similar, organizations may still consider customizing training content to cater to specific job responsibilities, ensuring maximum relevance for different roles.

Sentiment Analysis: Employee Feedback on AI-Based Training

The sentiment analysis of employee feedback (figure 4) on AI-driven training programs revealed that 82 % of employees expressed positive sentiments, appreciating personalized recommendations, structured learning, and enhanced skill acquisition. Many highlighted the flexibility and convenience of AI-based training, noting that it allowed them to learn at their own pace while receiving targeted content based on performance and progress. Features like NLP-driven feedback and HR analytics further contributed to making training more relevant to job responsibilities, increasing perceived value and effectiveness.

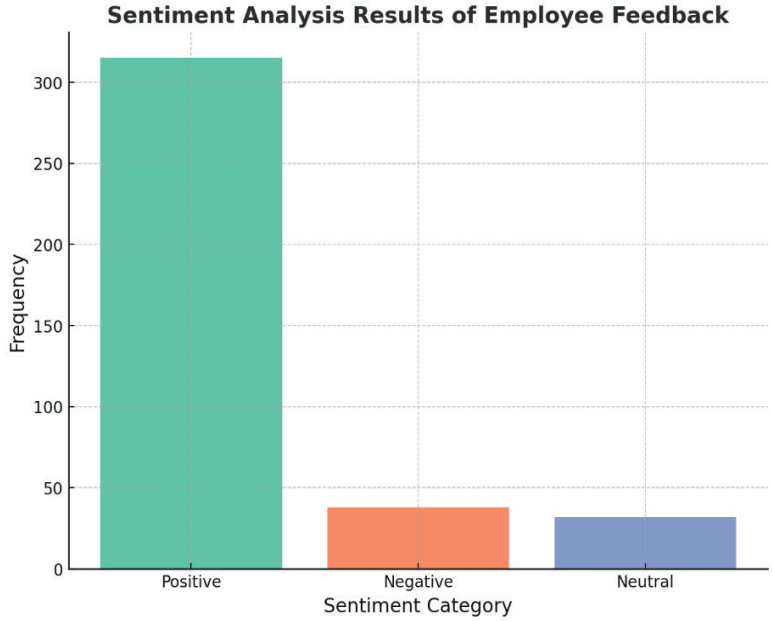

Figure 4. Sentiment Analysis Result

However, 8 % of employees gave neutral feedback, reflecting mixed experiences. While recognizing the benefits of automation and personalization, they raised concerns about the interactivity and practicality of the content. Employees in technical and managerial roles noted a lack of hands-on applications and real-world relevance, with some AI-generated content being repetitive or misaligned with professional development goals. A smaller group, 10 %, expressed negative sentiments, citing issues such as irrelevant content, low engagement, and over-reliance on passive learning formats like videos and quizzes. These employees preferred live interaction, real-time feedback, and collaborative learning environments, finding the automated nature of AI-driven training limiting. Concerns also included outdated course materials and insufficient adaptability to evolving job demands.

The results indicate broad acceptance of AI-driven training but also point to key areas for improvement. To enhance effectiveness, organizations should refine AI recommendations, ensure content relevance, and incorporate interactive learning methods such as simulations, case studies, and group projects. Additionally, adopting a blended learning approach—combining AI-based modules with instructor-led sessions—can cater

to diverse learning preferences. Regular updates to training content will also ensure alignment with industry trends and employee expectations, making AI-driven training more dynamic, personalized, and impactful.

DISCUSSION

The integration of AI-driven training methods and HR analytics in employee development has transformed traditional learning approaches within organizations. AI-based training systems, including adaptive learning algorithms and data-driven feedback mechanisms, are becoming increasingly prevalent in public institutions, offering personalized learning experiences and enhanced skill development opportunities. These advancements align with contemporary research advocating for the effectiveness of AI in workforce training and professional growth. Several studies have emphasized that AI-powered learning models improve knowledge retention and engagement by tailoring training to individual learning patterns.[11,12] These findings highlight the shift from generalized training modules to highly customized and interactive learning environments, allowing employees to gain relevant skills in an efficient and structured manner.

One of the core challenges in AI-driven training systems lies in ensuring that these technologies are not only accessible but also adaptable to diverse employee needs. While previous research has confirmed that personalized learning fosters higher engagement and satisfaction among employees, some scholars argue that automation in training can lead to reduced human interaction, which is a critical component of effective learning.[11,12,14] This raises concerns about the role of mentorship and interpersonal guidance in AI-driven training. Organizations must strike a balance between leveraging AI's efficiency and maintaining a human-centric approach in training programs to maximize knowledge transfer and application.

Another significant aspect of AI-driven training is its ability to analyse workforce data and identify skill gaps in real-time.[37,38,39,40] Studies have shown that HR analytics can predict future training needs, optimize learning experiences, and enhance workforce productivity.[41,42] This predictive capability enables organizations to proactively design training programs that align with industry trends and evolving job requirements, reducing the risk of skills obsolescence among employees.[43,44,45,46] However, challenges remain in ensuring that AI-based recommendations are truly aligned with employees' career trajectories and job roles. Prior research indicates that while AI can enhance learning personalization, its recommendations must be continuously refined to match organizational objectives and individual employee aspirations.[47,48,49,50,51,52]

Despite the potential of AI in improving workforce training, some studies have highlighted resistance among employees when transitioning from traditional training to AI-driven learning environments.[19] Factors such as technological literacy, skepticism toward AI recommendations, and preference for face-to-face training methods contribute to varied employee experiences. A research suggests that employees who are accustomed to instructor-led training may find AI-driven training impersonal and disengaging.[53,54] To address these concerns, organizations should incorporate hybrid training approaches that blend AI-powered learning with instructor-led sessions to ensure engagement, interactivity, and adaptability to different learning preferences.[55,56,57,58]

Furthermore, the effectiveness of AI-based training is influenced by organizational readiness and the availability of necessary technological infrastructure. Studies have demonstrated that organizations with robust digital transformation strategies are better positioned to implement AI-driven training successfully.[59,60] Public institutions, in particular, often face challenges related to budget constraints, resistance to change, and lack of adequate AI expertise, which can hinder the full adoption of data-driven training methods. Addressing these challenges requires strategic planning, investment in AI literacy programs, and continuous evaluation of AI training effectiveness to ensure its long-term sustainability.

Ethical considerations also play a crucial role in AI-based training implementations. Scholars have discussed the importance of transparency in AI decision-making, data privacy, and minimizing algorithmic biases in training recommendations.[61,62] AI-powered learning systems must be designed to ensure fairness and inclusivity, avoiding biases that could lead to disparities in training opportunities across different employee groups. Prior research has emphasized that organizations should continuously audit AI training systems to ensure that recommendations are equitable and do not reinforce existing skill gaps or workforce inequalities.[63]

AI-driven training and HR analytics are reshaping how employees acquire new skills and adapt to evolving job demands. While previous studies have supported the effectiveness of AI in improving training engagement, skill development, and workforce efficiency, challenges remain in ensuring AI's adaptability, addressing employee resistance, and maintaining ethical AI practices. Organizations must adopt a holistic approach that integrates AI's capabilities with human-led mentoring, continuous evaluation of AI-driven recommendations, and ethical considerations to fully harness the potential of AI-powered training. Future research should explore long-term impacts of AI-based learning on employee career growth, productivity, and organizational success to further refine training methodologies in public institutions and beyond.

CONCLUSIONS

AI-driven training and HR analytics have revolutionized employee development by providing personalized, adaptive, and data-informed learning experiences. These tools have improved skill acquisition, engagement, and productivity. However, successful implementation requires addressing challenges like employee resistance, technological adaptability, and ethical concerns. To maximize impact, organizations should balance AI automation with human interaction, ensure continuous refinement of recommendations, and align training with career growth. Public institutions, in particular, must enhance digital readiness, promote AI literacy, and ensure equitable access to training. The long-term success of AI-based training depends on strategic execution, ethical practices, and ongoing evaluation. Future research should examine its effects on career progression and organizational performance.

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BIBLIOGRAPHIC REFERENCES

1. Bobițan N, Dumitrescu D, Popa AF, Sahlian DN, Turlea IC. Shaping Tomorrow: Anticipating Skills Requirements Based on the Integration of Artificial Intelligence in Business Organizations—A Foresight Analysis Using the Scenario Method [Internet]. Vol. 13, Electronics. Multidisciplinary Digital Publishing Institute; 2024 [cited 2025 Feb]. p. 2198. Available from: https://doi.org/10.3390/electronics13112198

2. Dey D. Enhancing Educational Tools Through Artificial Intelligence in Perspective of Need of AI [Internet]. 2025 [cited 2025 Feb]. Available from: https://doi.org/10.2139/ssrn.5031275

3. Alnsour AS, Kanaan OA, Salah M, Alfayyad L, Hijazi Y, Alsharif D. The impact of implementing AI in recruitment on human resource management efficiency and organizational development effectiveness [Internet]. Vol. 8, Journal of Infrastructure Policy and Development. 2024 [cited 2025 Feb]. p. 6186. Available from: https://doi.org/10.24294/jipd.v8i8.6186

4. Fadlelmula FK, Qadhi S. A systematic review of research on artificial intelligence in higher education: Practice, gaps, and future directions in the GCC. Journal of University Teaching and Learning Practice [Internet]. University of Wollongong; 2024 Apr 19 [cited 2025 Feb];21(6). Available from: https://doi.org/10.53761/pswgbw82

5. Ly B. The Interplay of Digital Transformational Leadership, Organizational Agility, and Digital Transformation [Internet]. Vol. 15, Journal of the Knowledge Economy. Springer Science+Business Media; 2023 [cited 2025 Feb]. p. 4408. Available from: https://doi.org/10.1007/s13132-023-01377-8

6. Upadhyay AK, Khandelwal K. Artificial intelligence-based training learning from application [Internet]. Vol. 33, Development in Learning Organizations An International Journal. Emerald Publishing Limited; 2018 [cited 2025 Feb]. p. 20. Available from: https://doi.org/10.1108/dlo-05-2018-0058

7. Xie B, Liu H, Alghofaili R, Zhang Y, Jiang Y, Lobo FD, et al. A Review on Virtual Reality Skill Training Applications. Frontiers in Virtual Reality [Internet]. Frontiers Media; 2021 Apr 30 [cited 2025 Feb];2. Available from: https://doi.org/10.3389/frvir.2021.645153

8. Li YH, Li Y, Wei MY, Li G. Innovation and challenges of artificial intelligence technology in personalized healthcare. Scientific Reports [Internet]. Nature Portfolio; 2024 Aug 16 [cited 2025 Feb];14(1). Available from: https://doi.org/10.1038/s41598-024-70073-7

9. Jian MJKO. Personalized learning through AI [Internet]. Vol. 5, Advances in Engineering Innovation. 2023 [cited 2025 Feb]. p. 16. Available from: https://doi.org/10.54254/2977-3903/5/2023039

10. Hao L, Liu Q. Design of Resource Recommendation Model for Personalized Learning in the Era of Big Data [Internet]. 2019 [cited 2025 Feb]. p. 181. Available from: https://doi.org/10.1145/3377672.3378054

11. Ober TM, Lehman B, Gooch R, Oluwalana O, Solyst J, Phelps G, et al. Culturally Responsive Personalized Learning: Recommendations for a Working Definition and Framework [Internet]. Vol. 2023, ETS Research Report Series. Wiley; 2023 [cited 2025 Feb]. p. 1. Available from: https://doi.org/10.1002/ets2.12372

12. George S. Personalized employee experience can help with L&D goals [Internet]. 2017 [cited 2025 Mar 7]. Available from: https://www.gartner.com/smarterwithgartner/3-ways-personalization-can-improve-the-employee-experience

13. Rahaman MdA, Taru RD, Ahammad I, Durgude UP, Ali I. Impact of dynamic capabilities and green HR on sustainable performance in SMEs [Internet]. Vol. 22, Problems and Perspectives in Management. Business Perspectives; 2024 [cited 2025 Mar]. p. 693. Available from: https://doi.org/10.21511/ppm.22(4).2024.53

14. Garafonova O, КУЗІВ Р, КОСТЕЦЬКИЙ М. OPTIMIZATION OF EMPLOYEES' TRAINING AND DEVELOPMENT PROCESSES IN IT COMPANIES WITH THE HELP OF ARTIFICIAL INTELLIGENCE [Internet]. Vol. 330, Herald of Khmelnytskyi National University Economic sciences. 2024 [cited 2025 Mar]. p. 141. Available from: https://doi.org/10.31891/2307-5740-2024-330-21

15. Iftikhar A, Al-Hawary SIS, Alqudah M, Al-Adwan AS, Vasudevan A, Ali I, et al. Evaluating Inclusivity and Fairness of AI Recruitment Tools for Hiring People with Disabilities in the United Arab Emirates(UAE) [Internet]. Vol. 4, Data & Metadata. 2024 [cited 2025 Mar]. p. 487. Available from: https://doi.org/10.56294/dm2025487

16. Mohammad AAS, Mohammad SIS, Oraini BA, Hindieh A, Vasudevan A, Hunitie MFA, et al. Leveraging Predictive Analytics and Metadata Integration for Strategic Talent Management in Jordan [Internet]. Vol. 3, Data & Metadata. 2024 [cited 2025 Mar]. Available from: https://doi.org/10.56294/dm2024.599

17. OECD. Using AI in the workplace: Opportunities, risks and policy responses [Internet]. 2024 [cited 2025 Mar 7]. Available from: https://www.oecd-ilibrary.org/science-and-technology/using-ai-in-the-workplace_73d417f9-en

18. Suntharalingam H. Enhancing Digital Learning Outcomes Through the Application of Artificial Intelligence: A Comprehensive Review [Internet]. International Journal of Innovative Science and Research Technology (IJISRT). 2024 [cited 2025 Feb]. p. 718. Available from: https://doi.org/10.38124/ijisrt/ijisrt24apr530

19. Sharma A, Naik M, Radhakrishnan S. Personalized Learning Paths: Adapting Education with AI-Driven Curriculum [Internet]. 2023 [cited 2025 Feb]. Available from: https://doi.org/10.52783/eel.v14i1.993

20. Lee J, Song JH. How does algorithm-based HR predict employees' sentiment? Developing an employee experience model through sentiment analysis [Internet]. Vol. 56, Industrial and Commercial Training. Emerald Publishing Limited; 2024 [cited 2025 Mar]. p. 273. Available from: https://doi.org/10.1108/ict-08-2023-0060

21. Crum CR, Coglianese C. Taking Training Seriously: Human Guidance and Management-Based Regulation of Artificial Intelligence [Internet]. Vol. 1, 2022 International Joint Conference on Neural Networks (IJCNN). 2024 [cited 2025 Mar]. p. 1. Available from: https://doi.org/10.1109/ijcnn60899.2024.10651170

22. Uddin ASMA, Das D. The Power of Gamification in Employee Performance Management [Internet]. Vol. 11, Open Journal of Business and Management. Scientific Research Publishing; 2023 [cited 2025 Mar]. p. 3452. Available from: https://doi.org/10.4236/ojbm.2023.116188

23. Yaseen H, Mohammad AS, Ashal N, Abusaimeh H, Ali AAA, Sharabati AA. The Impact of Adaptive Learning Technologies, Personalized Feedback, and Interactive AI Tools on Student Engagement: The Moderating Role of Digital Literacy [Internet]. Vol. 17, Sustainability. Multidisciplinary Digital Publishing Institute; 2025 [cited 2025 Feb]. p. 1133. Available from: https://doi.org/10.3390/su17031133

24. Mohammad AAS, Mohammad SIS, Al-Daoud KI, Al Oraini B, Vasudevan A, Feng Z. Optimizing the Value Chain for Perishable Agricultural Commodities: A Strategic Approach for Jordan [Internet]. Vol. 6, Research on World Agricultural Economy; 2025 [cited 2025 Feb]. p. 465.

25. Dautil F, Fregin M, Hofmann M, Luckin R, Majchrzak TA, Broecke S, et al. Opportunities and drawbacks of using artificial intelligence for training [Internet]. OECD social employment and migration working papers. 2021 Dec [cited 2025 Feb]. Available from: https://doi.org/10.1787/22729bd6-en

26. Mohammad AAS, Al-Daoud KI, Rusho MA, Alkhayyat A, Doshi H, Dey P, Kiani M. Modeling polyethylene glycol density using robust soft computing methods [Internet]. Vol. 210, Microchemical Journal; 2025 [cited 2025 Feb]. p. 112815.

27. Maghsudi S, Lan A, Xu J, Schaar M van der. Personalized Education in the Artificial Intelligence Era: What to Expect Next [Internet]. Vol. 38, IEEE Signal Processing Magazine. Institute of Electrical and Electronics Engineers; 2021 [cited 2025 Feb]. p. 37. Available from: https://doi.org/10.1109/msp.2021.3055032

28. Mohammad AAS, Mohammad SIS, Al Oraini B, Vasudevan A, Alshurideh MT. Data security in digital accounting: A logistic regression analysis of risk factors [Internet]. Vol. 8, International Journal of Innovative Research and Scientific Studies; 2025 [cited 2025 Feb]. p. 2699.

29. Sampath K, Devi K, Ambuli TV, Venkatesan S. AI-Powered Employee Performance Evaluation Systems in HR Management [Internet]. 2024 [cited 2025 Mar]. p. 703. Available from: https://doi.org/10.1109/iccpct61902.2024.10673159

30. Mohammad AAS. The impact of COVID-19 on digital marketing and marketing philosophy: evidence from Jordan [Internet]. Vol. 48, International Journal of Business Information Systems; 2025 [cited 2025 Feb]. p. 267.

31. Westover J. Embracing AI in Change Management [Internet]. Vol. 13, Human capital leadership. 2024 [cited 2025 Mar]. Available from: https://doi.org/10.70175/hclreview.2020.13.1.11

32. Mohammad AAS, Al-Hawary SIS, Hindieh A, Vasudevan A, Al-Shorman MH, Al-Adwan AS, Turki Alshurideh M, Ali, I. Intelligent Data-Driven Task Offloading Framework for Internet of Vehicles Using Edge Computing and Reinforcement Learning [Internet]. Vol. 4, Data and Metadata; 2025 [cited 2025 Feb]. P. 521.

33. Agu EE, Abhulimen AO, Obiki-Osafiele AN, Osundare OS, Adeniran IA, Efunniyi CP. Utilizing AI-driven predictive analytics to reduce credit risk and enhance financial inclusion [Internet]. Vol. 3, International Journal of Frontline Research in Multidisciplinary Studies. 2024 [cited 2025 Feb]. p. 20. Available from: https://doi.org/10.56355/ijfrms.2024.3.2.0026

34. Mohammad AA, Shelash SI, Saber TI, Vasudevan A, Darwazeh NR, Almajali R. Internal audit governance factors and their effect on the risk-based auditing adoption of commercial banks in Jordan [Internet]. Vol. 4, Data and Metadata; 2025 [cited 2025 Feb]. P. 464.

35. Dwivedi D. Emotional Intelligence and Artificial Intelligence Integration Strategies for Leadership Excellence [Internet]. Vol. 26, Advances in Research. Sciencedomain International; 2025 [cited 2025 Feb]. p. 84. Available from: https://doi.org/10.9734/air/2025/v26i11235

36. Mohammad SIS, Al-Daoud KI, Al Oraini BS, Alqahtani MM, Vasudevan A, Ali I. Impact of Crude Oil Price Volatility on Procurement and Inventory Strategies in the Middle East [Internet]. Vol. 15, International Journal of Energy Economics and Policy; 2025 [cited 2025 Feb]. P. 715.

37. Chambi Apaza JJ, Almirón Cuentas JA, Bernedo-Moreira DH. Redefining Urban Spaces with Natural Elements: Biophilic Architecture. Land and Architecture. 2024; 3:105. https://doi.org/10.56294/la2024105

38. Azuaje G OA, Rosales A, Da Silva F. Application of simulation tools to HAZOP analysis of exothermic reaction processes. eVitroKhem. 2024; 3:102.

39. Vergara González FM, Sierra Franco AM, Verhelst Montenegro S. Representations and Imaginaries of Calle Real in the City of Sincelejo: Streets and Buildings in the Poetics of Living. Land and Architecture. 2022; 1:11. https://doi.org/10.56294/la202211

40. Rabozzi Orelo MJ. Mobile application for planning and monitoring healthy eating habits with artificial intelligence and augmented reality. Nursing Depths Series. 2024; 3:132.

41. Elrehail H. HR Analytics and Future of Work: A Systematic Literature Review [Internet]. 2022 International Conference on Business Analytics for Technology and Security (ICBATS). 2023 [cited 2025 Feb]. p. 1. Available from: https://doi.org/10.1109/icbats57792.2023.10111370

42. Galdolage BS, Ekanayake EA, Al-Daoud KI, Vasudevan A, Wenchang C, Hunitie MFA, Mohammad SIS. Sustainable Marine and Coastal Tourism: A Catalyst for Blue Economic Expansion in Sri Lanka [Internet]. Vol. 3, Journal of Ecohumanism; 2024 [cited 2025 Feb]. P. 1214.

43. Pastrana RN, Jalil T. Training and emerging technologies: Towards a new pedagogical paradigm. EthAlca. 2024; 3:101.

44. Estrada Meza RU, González Pérez MG. Analysis of public transport fares in Guadalajara, Mexico. Transport, Mobility & Society. 2023; 2:72. https://doi.org/10.56294/tms202372

45. Díaz Cruz SA, Batista Villar T, Valido-Valdes D, Núñez Núñez Y, Fernández González JL. Factors that impact in the answer of the ulcers from the diabetic foot to the Heberprot-P®. Podiatry (Buenos Aires). 2025; 4:151.

46. Hernández Bridón LJ. Environmental Education in Cuba. Environmental Research and Ecotoxicity. 2022; 1:9.

47. Rukadikar A, Khandelwal K. Artificial intelligence integration in personalised learning for employee growth: a game-changing strategy [Internet]. Vol. 22, Strategic HR Review. Emerald Publishing Limited; 2023 [cited 2025 Feb]. p. 191. Available from: https://doi.org/10.1108/shr-08-2023-0046

48. Ekanayake EA, Al-Daoud KI, Vasudevan A, Wenchang C, Hunitie MFA, Mohammad SIS. Leveraging Aquaculture and Mariculture for Sustainable Economic Growth in Sri Lanka: Challenges and Opportunities [Internet]. Vol. 3, Journal of Ecohumanism; 2024 [cited 2025 Feb]. P. 1229.

49. José da Fonseca A, Rosler JR. Cognitive-Behavioural Therapy and autism: a tool for inclusion based on rights. South Health and Policy. 2024; 3:133.

50. Vitón Castillo AA, Miló Valdés CA, Pérez Acevedo LC. Biological databases useful for epitope mapping and immune response simulation. eVitroKhem. 2025; 4:300.

51. Malagón Silva B. Trends in the use of artificial intelligence in the treatment of diabetic foot. Podiatry (Buenos Aires). 2025; 4:152.

52. Guataquira Rincón JL, Cuéllar Rodríguez RR. Considerations for the calculation of the Water Quality Risk Index according to current sanitary and epidemiological trends. Environmental Research and Ecotoxicity. 2023; 2:58.

53. Passalacqua M, Pellerin R, Yahia E, Magnani F, Rosin F, Joblot L, et al. Practice With Less AI Makes Perfect: Partially Automated AI During Training Leads to Better Worker Motivation, Engagement, and Skill Acquisition [Internet]. International Journal of Human-Computer Interaction. Taylor & Francis; 2024 [cited 2025 Mar]. p. 1. Available from: https://doi.org/10.1080/10447318.2024.2319914

54. Chen W, Vasudevan A, Al-Daoud KI, Mohammad SIS, Arumugam V, Manoharan T, Foong WS. Integrating cultures, enhancing outcomes: Perceived organizational support and its impact on Chinese expatriates' performance in Dubai [Internet]. Vol. 7, Herança; 2024 [cited 2025 Feb]. P. 25.

55. Rissone KA, Arruabarrena VM. Educational innovation with artificial intelligence and augmented reality. EthAlca. 2024; 3:107.

56. Estrada Meza RU, González Pérez MG. Urban Mobility and Social Justice: public transport in the Guadalajara metropolitan area, Mexico. Transport, Mobility & Society. 2023; 2:68. https://doi.org/10.56294/tms202368

57. Jarrin Valarezo BE, Arias Olmedo JK, Echeverría Caicedo KP. The role of nursing in patients with postpartum haemorrhage. Nursing Depths Series. 2023; 2:61.

58. Nifoci V, Cabrera CE. Progress in health policies on CBD in Argentina and MERCOSUR. South Health and Policy. 2024; 3:139.

59. Najem NR, Salman MK, Mohammed M, Madhi ZJ. Navigating Digital Transformation Strategies for Sustaining Competitive Advantage in the AI Era [Internet]. Vol. 3, Journal of Ecohumanism. 2024 [cited 2025 Mar]. p. 927. Available from: https://doi.org/10.62754/joe.v3i5.3947

60. Al-Oraini B, Khanfar IA, Al-Daoud K, Mohammad SI, Vasudevan A, Fei Z, Al-Azzam MKA. Determinants of Customer Intention to Adopt Mobile Wallet Technology [Internet]. Vol. 18, Appl. Math; 2024 [cited 2025 Feb]. P. 1331.

61. Agrawal TS. Ethical Implications of AI in Decision - Making: Exploring Bias, Accountability, and Transparency in Autonomous Systems [Internet]. Vol. 13, International Journal of Science and Research (IJSR). 2024 [cited 2025 Mar]. p. 20. Available from: https://doi.org/10.21275/sr241127154622

62. Ayyalsalman KM, Alolayyan MN, Alshurideh MT, Al-Daoud K, Al-Hawary SIS. Mathematical Model to Estimate The Effect of Authentic Leadership Components on Hospital Performance [Internet]. Vol. 18, Appl. Math; 2024 [cited 2025 Feb]. P. 701.

63. Goel S, Tejay G. Editorial: Are we ready for auditing AI-based systems? [Internet]. Vol. 2, Organizational Cybersecurity Journal Practice Process and People. 2022 [cited 2025 Mar]. p. 77. Available from: https://doi.org/10.1108/ocj-08-2022-037

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