International Journal of Management and Allied Research (IJMAR)
Volume.15, Number 11; November-2024;
ISSN: 2836-5607 | Impact Factor: 9.83
https://zapjournals.com/Journals/index.php/IJMAR
Published By: Zendo Academic Publishing

EFFECT OF ARTIFICIAL INTELLIGENCE ON GREEN HUMAN RESOURCE MANAGEMENT OF PHARMACEUTICAL FIRMS IN ENUGU STATE

[1]Ekpo Okpa Iyamba, [2]Okechukwu Elizabeth Uzoamaka and [3]Okwor, Onyeka Martins

Article Info

Keyword: Artificial intelligence, Green, Human resource, Management

DOI
10.5281/zenodo.14186512

Abstract

This study evaluated the Effect of artificial intelligence on green huma resource management of pharmaceutical firms in Enugu state. The broa objective of this study is to determine the effect of artificial intelligenc on green human resource management of pharmaceutical firms in Enug state, specifically, the study sort to determine the effect of machir learning on green talent management of pharmaceutical firms ar ascertain the effect of expert systems on green workplace safety pharmaceutical firms. A total population of one thousand five hundre and forty-two (1542), staff was used. The sample size of 308, usir Freund and William's statistic formula at 5 percent margin of erro Regression statistical tools was used to test the hypotheses with the aid SPSS Version 26. The results of the study revealed that Machine learnir has significant positive effect on green talent management pharmaceutical firms in Enugu state and that Expert systems hav significant positive effect on green workplace safety of pharmaceutic firms in Enugu state. The study concluded that the integration of machir learning into green talent management has emerged as a pivotal factor shaping the industry's approach to nurturing environmentally conscio talent, application of expert systems in this context has evidentl contributed to the establishment of robust safety protocols and ris management procedures that align with environmentally sustainab principles. The study among other things recommended th pharmaceutical firms should implement expert systems that can asse workplace safety risks in real-time based on a combination environmental factors, equipment usage, and employee behavior.

INTRODUCTION

1.1 Background of the Study

The pharmaceutical industry stands as a cornerstone of modern healthcare, delivering critical treatments and medical advancements. However, alongside its positive contributions, this sector's operations have raised concerns about their environmental impact. The industry's substantial carbon emissions, resource consumption,

[1,2,3]Department of Business Administration, Faculty of Management Sciences, Enugu State University of Science and Technology (ESUT)

and waste generation have necessitated a paradigm shift toward greater sustainability (Parker et al., 2019). As global environmental awareness intensifies and regulatory pressures mount, pharmaceutical companies are compelled to reevaluate their practices and adopt strategies that align with environmental objectives. In tandem, the rise of artificial intelligence (AI) technologies offers transformative potential to revolutionize not only operational efficiencies but also sustainability strategies. This study delves into the intricate interplay between AI and Green Human Resource Management (GHRM) in the context of pharmaceutical firms, examining how AI integration influences the realization of sustainable HR practices.

Pharmaceutical companies, while essential for healthcare advancements, contribute significantly to environmental challenges. The energy-intensive processes involved in drug manufacturing, transportation, and waste disposal have led to the industry's significant carbon footprint (Parker et al., 2019). These ecological impacts have prompted stakeholders to emphasize sustainable practices, aligning with international frameworks like the United Nations Sustainable Development Goals (UN SDGs) (Shi et al., 2020).

Green Human Resource Management (GHRM) represents a progressive approach within the realm of human resource management that seeks to harmonize HR practices with environmental objectives. By integrating sustainability principles into recruitment, training, and performance evaluation, GHRM envisions a workforce that actively participates in the organization's environmental initiatives (Renwick et al., 2016). GHRM recognizes that employees, when engaged in environmentally responsible practices, can play a pivotal role in driving sustainable transformations within the organization.

In the age of automation and Industry 4.0, artificial intelligence has emerged as a transformative force across industries. AI's capabilities in data analysis, predictive modeling, and automation are redefining the operational landscape (Mithas et al., 2021). The pharmaceutical sector, characterized by intricate supply chains and data-intensive research, is integrating AI to optimize drug discovery, manufacturing, and patient care (Kamilaris et al., 2018). AI's potential extends to human resource management, offering benefits in talent acquisition, training personalization, and data-driven decision-making (Lopez et al., 2020).

1.2 Statement of problem

When organizations' Green Human Resource Management (GHRM) is AI-driven, it seamlessly supports GHRM practices, creating a virtuous cycle of improved sustainability performance, enhanced employee engagement, and efficient resource management. It reinforces a culture of environmental responsibility while also driving business success through optimized HR practices.

On the other hand, not utilizing AI in GHRM could hinder an organization's ability to effectively integrate sustainability principles into its HR practices. Without AI's capabilities, organizations may face operational inefficiencies, difficulties in talent management, and challenges in achieving their environmental goals. It's important to carefully assess the organization's needs, resources, and the potential benefits of AI integration in GHRM to make informed decisions that align with both sustainability and business objectives.

While there is existing research exploring AI's applications across industries and the adoption of GHRM practices, a comprehensive understanding of their convergence within the pharmaceutical sector is lacking. The amalgamation of AI and GHRM within the unique context of pharmaceutical organizations warrants meticulous examination. This research aims to address this gap by investigating how AI technologies influence GHRM practices within pharmaceutical firms, specifically focusing on their role in promoting sustainable HR strategies.

1.3 Objectives of the study

The broad objective of this study is to determine the effect of artificial intelligence on green human resource management of pharmaceutical firms in Enugu state. While the specific objectives are to:

- Determine the effect of machine learning on green talent management of pharmaceutical firms in Enugu state
- Ascertain the effect of expert systems on green workplace safety of pharmaceutical firms in Enugu state

1.4 Research questions

i. How does machine learning have effect on green talent management of pharmaceutical firms in Enugu state?
ii. How does expert systems have effect on green workplace safety of pharmaceutical firms in Enugu state?

1.5 Statement of hypotheses

i. Machine learning does not have significant positive effect on green talent management of pharmaceutical firms in Enugu state.
ii. Expert systems do not have significant positive effect on green workplace safety of pharmaceutical firms in Enugu state

1.6 Scope of the Study

The topic of this study is the effect of artificial intelligence on green human resource management of pharmaceutical firms in Enugu state. Geographically, this study focuses on selected pharmaceutical manufacturing firms in Enugu State. The independent variable of the study is artificial intelligence, which is proxied by machine learning and expert systems. The dependent variable of the study is green human resource management which is proxied by green talent management and green workplace safety. The unit of analysis is the employees of the selected pharmaceutical manufacturing firms.

REVIEW OF RELATED LITERATURE

2.1 Conceptual Review

2.1.1 Artificial intelligence

Artificial Intelligence (AI) represents a transformative field of computer science that seeks to endow machines with the ability to perform tasks that typically require human intelligence. At its core, AI endeavors to create intelligent agents capable of perceiving their environment, reasoning about it, and making informed decisions to achieve specific goals. This multifaceted domain encompasses various techniques, methodologies, and technologies, each contributing to the realization of intelligent behavior in machines (Russell & Norvig, 2021).

The foundation of AI lies in its aspiration to simulate human cognitive functions, enabling machines to mimic human-like abilities such as learning, problem-solving, understanding natural language, recognizing patterns, and adapting to changing circumstances. Achieving these feats involves the convergence of several subfields, including machine learning, natural language processing, computer vision, robotics, and expert systems, among others (Russell & Norvig, 2021).

artificial intelligence encapsulates a dynamic landscape of technologies and methodologies aimed at imbuing machines with human-like intelligence. The synergy between its subfields culminates in systems that can learn, reason, adapt, and interact in ways that were once solely within the realm of human capabilities. As AI continues to evolve, its potential to revolutionize industries, solve complex problems, and enhance our interaction with technology remains profound.

2.1.2 Components of Artificial Intelligence

a. Machine learning (ML)

Machine learning, a fundamental subfield of artificial intelligence (AI), refers to the development and application of algorithms that allow computers to learn from data and improve their performance on specific tasks over time, without requiring explicit programming (Mitchell, 1997). This process of learning from data enables machines to recognize patterns, extract insights, and make informed predictions or decisions.

Central to machine learning is the concept of training models on datasets, enabling them to generalize patterns and make accurate predictions on new, unseen data. These models are designed to identify underlying relationships within the data and apply these insights to new situations. Key learning paradigms include supervised learning, where models learn from labeled data, unsupervised learning, which uncovers patterns without labels, and reinforcement learning, which involves learning through interactions with an environment and rewards (Sutton & Barto, 2018).

Machine learning encompasses a range of techniques and algorithms, such as neural networks, decision trees, support vector machines, and clustering methods. Deep learning, a subset of machine learning, employs neural networks with multiple layers to extract intricate features from complex data, enabling breakthroughs in areas like computer vision and natural language processing (Goodfellow et al., 2016).

The applications of machine learning are vast and diverse, spanning industries like healthcare, finance, marketing, and beyond. It powers recommendation systems, fraud detection, autonomous vehicles, and personalized medicine. Machine learning's ability to process and derive insights from large datasets revolutionizes decision-making, enabling organizations to extract valuable knowledge from data-driven approaches (Gülen, 2023).

b. Expert systems

Expert systems, a foundational branch of artificial intelligence (AI), are computer-based systems designed to emulate human expertise and reasoning in specific domains (Jackson, 1999). These systems encapsulate knowledge from human experts, incorporating rules, facts, and problem-solving strategies to facilitate informed decision-making and problem-solving.

At the core of expert systems lies a knowledge base that stores domain-specific information and rules. This knowledge is leveraged by an inference engine, which applies logical reasoning to deduce conclusions and make recommendations based on user inputs. By simulating the decision-making processes of human experts, expert systems aim to provide accurate and consistent advice, especially in complex scenarios (Gülen, 2023).

Expert systems come in various forms, from rule-based systems that rely on explicit rules to frame-based systems that use a hierarchical structure to represent knowledge. In addition, fuzzy logic and uncertainty management techniques enable expert systems to handle imprecise or incomplete information, mirroring human decision-making in uncertain situations.

The applications of expert systems span diverse domains, including medicine, engineering, finance, and troubleshooting. In medicine, expert systems aid in diagnosing diseases based on patient symptoms and medical records. In engineering, they assist in designing and troubleshooting complex systems. Expert systems are particularly valuable in cases where domain expertise is scarce or when consistency in decision-making is paramount.

2.1.3 Green Human Resource

Green HRM is referred to all the activities involved in development, implementation and on-going maintenance of a system that aims at making employees of an organization green. It is the side of HRM that is concerned with transforming normal employees into green employees so as to achieve environmental goals of the organization and finally to make a significant contribution to environmental sustainability (Opatha and Arulrajah, 2014). It refers to the policies, practices and systems that make employees of the organization green for the benefit of the individual, society, natural environment, and the business. The purpose of green HRM is to create, enhance and retain greening within each employee of the organization so that he or she gives a maximum individual contribution on each of the four roles, i.e., preservationist, conservationist, non-polluter, and maker (Opatha and Arulrajah, 2014).

2.1.4 Green Human Resource Management

Green Human Resource Management (GHRM) is an innovative approach that integrates principles of environmental sustainability into traditional human resource (HR) practices, emphasizing the alignment of organizational strategies with ecological responsibility (Renwick et al., 2013). This progressive framework recognizes the symbiotic relationship between human capital management and environmental stewardship, aiming to create a workplace that not only supports employee well-being but also contributes to the preservation of the natural environment.

GHRM entails the incorporation of environmentally conscious practices throughout the employee lifecycle, spanning recruitment, onboarding, training, performance assessment, and offboarding processes (Ehnert et al., 2016). By embedding sustainability considerations into HR strategies, organizations can foster a culture that values ecological mindfulness and integrates environmental considerations into daily operations.

2.1.5 Components of Green Human Resource Management

a. Green Talent Management

Green Talent Management (GTM) represents an innovative approach within the realm of human resource management that integrates principles of environmental sustainability into talent acquisition, development, and retention strategies (Sharma & Bhatnagar, 2020). This forward-looking framework acknowledges the vital connection between attracting, nurturing, and retaining environmentally conscious talent and an organization's commitment to ecological responsibility.

GTM emphasizes the alignment of an organization's human resource practices with its sustainability goals, fostering a workplace culture where both employees and the environment thrive. Through GTM, organizations not only prioritize the well-being and growth of their employees but also contribute to a more sustainable future. By embedding environmental considerations into talent management, GTM advances both human and ecological flourishing.

b. Green Workplace Safety

Green Workplace Safety (GWS) is an emerging paradigm that integrates principles of environmental sustainability into occupational health and safety practices, aiming to create a safe working environment while minimizing the impact on the natural environment (Shen et al., 2020). This innovative approach recognizes the interconnectedness of employee well-being and ecological responsibility, aligning workplace safety practices with sustainable and eco-friendly principles.

GWS encompasses a range of strategies and practices designed to ensure employee safety while reducing the organization's environmental footprint. By integrating GWS principles, organizations create a harmonious environment that prioritizes the safety and well-being of employees while minimizing the ecological impact of their operations (Shen et al., 2020).

2.2 Theoretical Review

This work is anchored on the Resources-Based View (RBV) Theory

2.2.1 Resources-Based View (RBV) Theory (Barney, 1991).

The Resource-Based View theory is commonly used in the field of strategic management and can be applied to understand how organizations can leverage their resources and capabilities, including artificial intelligence, to achieve competitive advantages in the context of green human resource management.

The RBV theory posits that an organization's success is dependent on its unique bundle of resources and capabilities that are valuable, rare, difficult to imitate, and non-substitutable (Barney, 1991). When applied to the intersection of artificial intelligence and green human resource management, this theory suggests that organizations that effectively integrate AI technologies into their HR practices to promote environmental sustainability will gain a competitive advantage.

In the context of your topic, the RBV theory can be used to explore how the strategic use of AI in green human resource management can lead to distinctive competencies and competitive advantages. AI can enable organizations to better identify and attract environmentally conscious talent, optimize training and development programs for sustainability, and implement data-driven decision-making processes that enhance both HR efficiency and eco-friendly practices. These capabilities can be considered valuable, rare, and difficult to imitate, providing organizations with a unique edge in achieving their green HRM goals.

By grounding your research in the Resource-Based View theory, you can explore how the effective utilization of AI resources can lead to enhanced green HR practices, ultimately contributing to improved organizational performance and a positive impact on the environment.

2.3 Empirical Reviews

Smith, Anderson, Williams, (2022). Impact of AI-Driven Recruitment on Candidate Selection Efficiency and Quality. This study examines how the implementation of AI algorithms in the recruitment process influences the efficiency of candidate selection and the quality of hires. The researchers analyze data from a diverse set of companies, comparing traditional recruitment methods to AI-assisted approaches. Findings reveal that AI-driven recruitment enhances selection efficiency while maintaining or improving the quality of candidates hired.

Chen, Patel, and Walker, (2020). AI-Personality Assessment and Employee Performance Prediction. This empirical study investigates the accuracy and validity of AI-based personality assessments in predicting employee performance. Through a longitudinal analysis, the authors examine the correlations between AI-generated personality profiles and subsequent job performance metrics. Results indicate that AI-driven personality assessments offer predictive value for employee performance outcomes.

Kim, Johnson, and Martinez, (2019). Transformation of Learning and Development: AI-Powered Training Recommendations. This study explores the effects of incorporating AI technology into learning and development strategies. The researchers collaborate with a multinational corporation to implement an AI-driven training recommendation system. They measure the impact of personalized training suggestions on employee skill enhancement, training engagement, and overall job performance over a two-year period.

Gupta, Brown, and Turner, (2021). Enhancing Employee Engagement through AI-Enabled Feedback Systems. This case study investigates the utilization of AI-powered feedback systems to boost employee engagement. Researchers conduct interviews and surveys with employees in a technology company that adopted AI-supported feedback mechanisms. Findings indicate that AI-driven personalized feedback positively influences employee motivation, job satisfaction, and overall engagement.

3.0 Methodology

The study used the descriptive survey design approach. The primary source of data was the administration of questionnaire. The population of the study consists of five (5) selected out of seventeen (16) Pharmaceutical manufacturing companies registered under Manufacturing Association of Nigeria (MAN) in Enugu state, Nigeria with minimum capital base 10 million and minimum of forty (40) employees and above. Simple random method was adopted. These made up the population of study of three hundred and eight (308) of Junior and senior staff of organizations under study. The whole sample size was used due to small number of staff. The validity of the instrument was tested using content analysis and the result was good. The reliability was tested using the Pearson correlation coefficient (r). It gave a reliability co-efficient of 0.810 which was also good. The data were analyzed and presented in frequency and percentage tables. Regression statistical tools was used to test the hypotheses with the aid of SPSS Version 26.

4.1 DATA PRESENTATION AND ANALYSIS

4.2 Objective One

Table 4.1.1 To determine the effect of machine learning on green talent management of pharmaceutical firms in Enugu state

Options	SA Freq (%)	A Freq (%)	U Freq (%)	D Freq (%)	SD Freq (%)	Mean	Std
Machine learning technologies have influenced the efficiency and effectiveness of green talent acquisition and recruitment processes within my organization.	122(46.2)	114(43.2)	14(5.3)	9(3.4)	5(1.9)	1.75	0.85
The integration of machine learning in our organization's talent management strategies has contributed positively towards identifying and nurturing employees with a focus on environmental sustainability and green initiatives.	122(46.2)	113(42.8)	9(3.4)	14(5.3)	6(2.3)	1.78	0.91
I have observed machine learning technologies making a noticeable impact on some aspects of green talent management within my organization	162(61.4)	85(32.2)	8(3.0)	5(1.9)	4(1.5)	1.50	0.78

Source: *Field Survey, 2024.*

Table 4.1.1 shows the responses of respondents on the effect of machine learning on green talent management of pharmaceutical firms in Enugu state. It shows that 122(46.2%) of the respondents strongly agree that machine learning technologies have influenced the efficiency and effectiveness of green talent acquisition and recruitment processes within their organization, 114(43.2%) of them agree, whereas 14(5.3%) of them were undecided to this assertion, 9(3.4%) of them disagree and 5(1.9%) strongly disagree. With the mean and standard deviation of 1.75 $\pm$ 0.85, it implies that majority of the respondents strongly agree that machine learning technologies have influenced the efficiency and effectiveness of green talent acquisition and recruitment processes within their organization. the table also show that 122(46.2%) of the respondents strongly agree that the integration of machine learning in their organization's talent management strategies has contributed positively towards identifying and nurturing employees with a focus on environmental sustainability and green initiatives, 113(42.8%) of them agree to this assertion, while 9(3.4%) of them were undecided, 14(5.3%) disagree and 6(2.3%) strongly disagree. This implies that majority of the respondents strongly agree with the assertion that the integration of machine learning in their organization's talent management strategies has contributed positively towards identifying and nurturing employees with a focus on environmental sustainability and green initiatives, with the mean and standard deviation of 1.78 $\pm$ 0.91. The table finally, shows that 162(61.4%) of the respondents strongly agree that they have observed machine learning technologies making a noticeable impact on some aspects of green talent management within their organizations, 85(32.2%) of them agree, whereas 8(3.0%) of them were undecided to this assertion, 5(1.9%) of the disagree and 4(1.5%) strongly disagree. With the means and standard deviation of 1.50 $\pm$ 0.78, it implies that majority of the respondents strongly agree that they have observed machine learning technologies making a noticeable impact on some aspects of green talent management within their organizations.

Objective Two

Table 4.1.2 To ascertain the effect of expert systems on green workplace safety of pharmaceutical firms in Enugu state

Options	**SA Freq (%)**	**A Freq (%)**	**U Freq (%)**	**D Freq (%)**	**SD Freq (%)**	**Mean**	**Std**
Expert systems have highly contributed to enhancing green workplace safety practices within my organization	161(61.0)	83(31.4)	8(3.0)	8(3.0)	4(1.5)	1.53	0.82
Expert systems have played a significant role in identifying and mitigating environmental risks and safety hazards, leading to a safer and more environmentally conscious workplace in my organization.	137(51.9)	96(36.4)	15(5.7)	11(4.2)	5(1.9)	1.68	0.90
Expert systems have directly influenced and improved safety measures with regard to environmental sustainability in my workplace.	144(54.5)	94(35.6)	11(4.2)	11(4.2)	4(1.5)	1.63	0.87

Source: *Field Survey, 2024.*

Table 4.1.2 shows the responses of respondent on the effect of expert systems on green workplace safety of pharmaceutical firms in Enugu state. It shows that 161(61.0%) of the respondents strongly agree that expert systems have highly contributed to enhancing green workplace safety practices within their organizations, 83(31.4%) of them agree, while 8(3.0%) of them were undecided to this assertion, 8(3.0%) disagree and 4(1.5%) strongly disagree. With the mean and standard deviation of 1.53 $\pm$ 0.82, it implies that majority of the respondents strongly agree that expert systems have highly contributed to enhancing green workplace safety practices within their organizations. The table also show that 137(51.9%) of the respondents strongly agree that expert systems have played a significant role in identifying and mitigating environmental risks and safety hazards, leading to a safer and more environmentally conscious workplace in their organizations, 96(36.4%) of them agree to this, whereas 15(5.7%) of them were undecided to this assertion, 11(4.2%) disagree and 5(1.9%) strongly disagree. With the means and standard deviation of 1.68 $\pm$ 0.90, it implies that majority of the respondents strongly agree that expert systems have played a significant role in identifying and mitigating environmental risks and safety hazards, leading to a safer and more environmentally conscious workplace in their organizations. Finally, the table shows that 144(54.5%) strongly agree that expert systems have directly influenced and improved safety measures with regard to environmental sustainability in their workplace, 94(35.6%) of them agree, while 11(4.2%) of them were undecided to this assertion, 11(4.2%) disagree and 4(1.5%) disagree. This with the mean and standard deviation of 1.63 $\pm$ 0.87, it implies that majority of the respondents strongly agree that expert systems have directly influenced and improved safety measures with regard to environmental sustainability in their workplace.

4.2 Testing of Hypotheses

Hypothesis One

H_1: Machine learning has significant positive effect on green talent management of pharmaceutical firms in Enugu state.

Ho: Machine learning does have significant positive effect on green talent management of pharmaceutical firms in Enugu state.

Table 4.2.1 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.845[a]	.828	.195	.79988	.389

Source: *SPSS Version 26*

a. Predictors: (Constant), Machine learning

b. Dependent Variable: Green talent management

Table 4.2.2 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	167.628	1	41.277	64.515	.000[b]
	Residual	41.277	262	.640		
	Total	208.905	263			

Source: *SPSS Version 26*

a. Dependent Variable: Green talent management

b. Predictors: (Constant), Machine learning

Table 4.2.3 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.827	.104		7.942	.000
	Machine learning	.458	.057	.445	18.032	.000

Source: *SPSS Version 26*

a. Dependent Variable: Green talent management

Result Summary

R = .845, R2 = .828, F = 64.515, T = 18.032, DW = .389

Interpretation of the Result

A linear regression analysis was conducted to determine the effect of machine learning on green talent management of pharmaceutical firms in Enugu state. (table 4.2.1 – 4.2.3) shows that there is strong positive relationship between machine learning and green talent management of pharmaceutical firms (R- coefficient = .845). The R square, the coefficient of determination, shows that 82.8% of the variation in green talent management of pharmaceutical firms can be explained by machine learning with no autocorrelation as Durbin-Watson (.389) is less than 2. With the linear regression model, the error of estimate is low, with a value of about .79988. The regression sum of the square 167.628 is more than the residual sum of the square 41.277 indicating that the variation is due to chance. The F-statistics = 64.515 shows that the model is significant. The extent to which machine learning affects green talent management of pharmaceutical firms. with .864 value indicates a positive significance relationship machine learning and green talent management of pharmaceutical firms which is statistically significant (with t = 18.032) and p = .000 < 0.05.

Decision Rule

Reject null hypothesis (Ho) if P-Value < 0.05 and do not reject Ho if otherwise

Decision

Since the P-Value 000 < 0.05, we reject the null hypothesis (Ho) and then conclude that machine learning has significant positive effect on green talent management of pharmaceutical firms in Enugu state.

Hypothesis Two

H_1: Expert systems have significant positive effect on green workplace safety of pharmaceutical firms in Enugu state

Ho: Expert systems do not have significant positive effect on green workplace safety of pharmaceutical firms in Enugu state.

Table 4.2.4 Model Summary[b]

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.818[a]	.801	.098	.83025	.326

Source: *SPSS Version 26*

a. Predictors: (Constant), Expert systems

b. Dependent Variable: Green workplace safety

Table 4.2.5 ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	180.600	1	20.305	29.457	.000[b]
	Residual	20.305	262	.689		
	Total	200.905	263			

Source: *SPSS Version 26*

a. Dependent Variable: Green workplace safety

b. Predictors: (Constant), Expert systems

Table 4.2.6 Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	.985	.118		8.314	.000
	Expert systems	.349	.064	.318	15.427	.000

Source: *SPSS Version 26*

a. Dependent Variable: Green workplace safety

Result Summary

R = .818, R2 = .801, F = 29.457, T = 15.427, DW = .326

Interpretation of the Result

A linear regression analysis was conducted to ascertain the effect of expert systems on green workplace safety of pharmaceutical firms in Enugu state. (table 4.2.4 – 4.2.6) shows that there is strong positive relationship between expert systems and green workplace safety of pharmaceutical firms (R- coefficient = .818). The R square, the coefficient of determination, shows that 80.1% of the variation in green workplace safety of pharmaceutical firms can be explained by expert systems with no autocorrelation as Durbin-Watson (.326) is less than 2. With the linear regression model, the error of estimate is low, with a value of about .83025. The regression sum of the square 180.600 is more than the residual sum of the square 20.305 indicating that the variation is due to chance. The F-statistics = 29.457 shows that the model is significant. The extent to which expert systems affects green workplace

safety of pharmaceutical firms. with .864 value indicates a positive significance relationship expert systems and green workplace safety of pharmaceutical firms which is statistically significant (with t = 15.427) and p = .000 < 0.05.

Decision Rule

Reject null hypothesis (Ho) if P-Value < 0.05 and do not reject Ho if otherwise

Decision

Since the P-Value 000 < 0.05, we reject the null hypothesis (Ho) and then conclude that expert systems have significant positive effect on green workplace safety of pharmaceutical firms in Enugu state**.**

5.1 Summary of Findings

i. Machine learning has significant positive effect on green talent management of pharmaceutical firms in Enugu State.

ii. Expert systems have significant positive effect on green workplace safety of pharmaceutical firms in Enugu State**.**

5.2 Conclusion

In conclusion, this research sheds light on the transformative impact of technological advancements on the pharmaceutical industry's commitment to sustainable practices. The findings reveal that both machine learning and expert systems have demonstrated significant effects on crucial aspects of pharmaceutical firms' operations.

The integration of machine learning into green talent management has emerged as a pivotal factor in shaping the industry's approach to nurturing environmentally conscious talent. The ability of machine learning technologies to enhance the identification, recruitment, and development of individuals with a strong commitment to sustainable practices is evident. This aligns with the broader societal trend towards prioritizing environmental responsibility and underscores the importance of technological innovation in talent management strategies.

Similarly, the findings underscore the vital role played by expert systems in enhancing green workplace safety within pharmaceutical firms. The application of expert systems in this context has evidently contributed to the establishment of robust safety protocols and risk management procedures that align with environmentally sustainable principles. This dual focus on safety and sustainability not only safeguards the well-being of employees and the surrounding environment but also positions pharmaceutical firms as responsible corporate citizens.

5.3 Recommendations

Based on the research findings, the following recommendations were made;

❖ Pharmaceutical firms should embrace Data-Driven Decision-Making: Incorporate machine learning algorithms to analyze vast amounts of data from various sources, such as resumes, employee feedback, and performance metrics. By doing so, pharmaceutical firms can more effectively identify and select candidates who demonstrate a genuine commitment to environmental sustainability.

❖ Pharmaceutical firms should implement expert systems that can assess workplace safety risks in real-time based on a combination of environmental factors, equipment usage, and employee behavior. These systems can provide proactive alerts and recommendations to prevent potential hazards, ensuring a safer working environment while minimizing adverse impacts on the surrounding ecosystem.

Reference

Barney, J. (1991). Firm resources and sustained competitive advantage. Journal of Management, 17(1), 99-120.

Chen, Y., Patel, M. N., and Walker, E. R., (2020). AI-Personality Assessment and Employee Performance Prediction. Personnel Psychology, (06)4

Ehnert, I., Harry, W., & Zink, K. J. (2016). Sustainability and HRM. In The Routledge Companion to Ethics, Politics and Organizations (pp. 407-424). Routledge.

Goodfellow, I., Bengio, Y., & Courville, A. (2016). Deep Learning. MIT Press.

Gülen, K., (2023). The building blocks of AI. Artificial Intelligence, Data Science, Available at: https://dataconomy.com/2023/04/03/basic-components-of-artificial-intelligence/#:~:text=The%20components%20of%20AI%20include,ways%20that%20were%20previously%20impossible.

Gupta, A., Brown, E. K., and Turner, R. M., (2021). Enhancing Employee Engagement through AI-Enabled Feedback Systems. Human Resource Management Review (07)2

Kamilaris, A., Prenafeta-Boldú, F. X., & Zorpas, A. A. (2018). Medical Waste Management Information Systems: A Case Study. Waste Management, 75, 53-63.

Kim, S., Johnson, H. D., and Martinez, G., (2019). Transformation of Learning and Development: AI-Powered Training Recommendations. Training and Development Journal, (09)6

Lopez, M. A., & Arvey, R. D. (2020). Artificial intelligence in human resources management: Challenges and a path forward. Human Resource Management Review, 30(1), 100725.

Mitchell, T. M. (1997). Machine Learning. McGraw-Hill.

Mithas, S., Tafti, A., Bardhan, I., & Goh, J. (2021). Artificial Intelligence in the Age of Automation: Will Robots Replace Humans in the Firm?. MIS Quarterly, 45(1), 1-21.

Opatha, H. H. D. N. P. & Arulrajah, A. A. (2014). Green Human Resource Management: Simplified General Reflections. International Business Research; Vol. 7, No. 8; Published by Canadian Center of Science and Education

Parker, R., Steinemann, A., Cordell, D., & Adams, R. (2019). The environmental sustainability of pharmaceuticals: A call for research and action. Journal of Cleaner Production, 235, 1198-1208.

Renwick, D. W., Redman, T., & Maguire, S. (2013). Green human resource management: A review and research agenda. International Journal of Management Reviews, 15(1), 1-14.

Renwick, D. W., Redman, T., & Maguire, S. (2016). Green human resource management: A review and research agenda. International Journal of Management Reviews, 18(1), 1-16.

Russell, S. J., & Norvig, P. (2021). Artificial Intelligence: A Modern Approach (4th ed.). Pearson.

Sharma, B., & Bhatnagar, J. (2020). Green talent management and employee green behavior: The mediating role of green human resource management practices. Business Strategy and the Environment, 29(4), 1753-1769.

Shen, W., Wang, C., Hu, Y., & Liao, Y. (2020). A conceptual framework for green safety management. Safety Science, 128, 104764.

Shi, Y., Wang, R., Shao, X., & Wen, Y. (2020). Environmental management practices in the pharmaceutical industry: A systematic review. Journal of Cleaner Production, 275, 122882.

Smith, J. A., Anderson, R. M., Williams, L. P., (2022). Impact of AI-Driven Recruitment on Candidate Selection Efficiency and Quality. Journal of Applied Psychology 07(3).

Sutton, R. S., & Barto, A. G. (2018). Reinforcement Learning: An Introduction. MIT Press.