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## Determinants of Employee Attrition: A Business Analytics Approach to Human Resource Management

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**Dr. Toluwanimi A. Akinjide<sup>1\*</sup>**  
**Dr. Chisom F. Ezeanyi<sup>2</sup>**  
**Dr. Oladunni M. Bakare<sup>3</sup>**

<sup>1\*</sup>Department of Human Resource Management, Caleb University, Lagos, Nigeria

<sup>2</sup>Department of Business Administration, Rhema University, Abia, Nigeria

<sup>3</sup>Department of Management and Social Sciences, Babcock University, Ogun, Nigeria

**Corresponding Author:**

\* Dr. Toluwanimi A. Akinjide  
Email: t.akinjide@calebuniversity.edu.ng

### ABSTRACT

The turnover of employees is a major issue for companies as it impacts workforce stability, productivity and the long-term performance of the organization. To create effective strategies for employee retention and enhance HRM practices, it is essential to understand the factors which cause the employees to leave the organization. The determinants of employee attrition are examined in this study using the IBM HR Analytics dataset that contains 1,470 records and 35 different variables related to the employee, organisations and working environment. A research design involving quantitative method combined descriptive statistical analysis and business analytics approach was used. Data preprocessing was performed to prepare the dataset for analysis, and a Logistic Regression model was developed to examine the influence of employee characteristics on attrition while evaluating predictive performance. The descriptive findings indicated considerable variation in employee income, organizational tenure, job satisfaction, work-life balance, and departmental affiliation. The predictive model achieved satisfactory classification performance, demonstrating the usefulness of business analytics in identifying employees with a higher likelihood of leaving the organization. The results indicated that there are a number of factors in the organization and workplace that affect employee attrition; no one factor can be identified as the determinant. The study reflects the importance of data to support evidence-based human resource management and offers a practical perspective on how to enhance employee retention by making targeted interventions in the organization. These findings add to the body of HR analytics literature in that they show how predictive analytics can help businesses to improve workforce planning and help to make them more effective into the future.

**KEYWORDS:** Employee attrition, Human resource analytics, Business analytics, Logistic regression, Employee retention

## 1. Introduction

The turnover of these valuable members of staff has become one of the biggest problems faced by organizations in today's world because of its negative impact on productivity, organizational knowledge, continuity of operations and long-term competitiveness. This is because frequent employee turnover leads to higher recruitment and training expenses, and lowers workforce stability, which is a driving force for employee retention to become a key strategy for organizations today. As a result, more and more organizations have gone on the path of evidence-based solutions to gain insight into the root causes of employee turnover, and to create effective employee retention strategies [1,2].

As more and more of this data becomes available, business analytics, and machine learning, are increasingly being used in HR. Human Resource (HR) analytics can help companies analyze employee-related data in a systematic way and find trends related to employee turnover, engagement and organizational performance. Predictive analytics has proven to be an effective decision support tool for managers by identifying individuals who are more likely to leave, and for timely action to prevent them from doing so [3]. Moreover, turnover has been proven to have a negative impact on organizational effectiveness as it leads to a decrease in efficiency, employee morale and the costs of hiring and replacing employees [4,5].

In recent years, it has been shown that combining HR analytics with cutting-edge analytical tools can enhance workforce planning and decision making for organizations. Modeling methods that fit into the category of machine learning have been successfully applied on predicting employee attrition based on demographic information, workplace environment, compensation, and employees' satisfaction indicators . Similarly, the literature has highlighted HR analytics information can offer actionable insights to organisations, which can improve strategic human resource management and in turn, improve organisational performance [6]. Recent studies also indicate that measures of employee engagement and behavioural measures can significantly enhance the predictive models of attrition, which in turn helps in making better workforce management decisions [7].

Nevertheless, much of the research on employee turnover focuses on the predictive power and has left out much discussion on organizational factors and implications. Research is still needed to consider both business analytics and actual HRM insights to determine what factors drive employee turnover and how to turn analytics into useful organizational decisions.

Hence, the current study aims to uncover the factors affecting employee attrition. The findings will be used to help facilitate evidence-based human resource management in order to devise data-driven retention policies that will increase workforce stability and organizational performance. The research utilizes descriptive statistical analysis and business analytics methodology to identify demographic, organizational, and job characteristics associated with employee turnover. The findings will be used to help facilitate evidence-based human resource management in order to devise data-driven retention policies that will increase workforce stability and organizational performance.

## **2. Review of Literature**

With technological advancements, Human Resource Analytics has now become an integral part of the process of handling the human resources of any organization. Studies conducted recently suggest that the process of HR analytics can be used in recognizing trends in the workforce, improving talent management, and creating retention strategies for employees. Organizations having data-based human resource processes will probably find themselves having more control over the performance of their employees, knowing what risks may be involved if the employees leave the organization, and taking action in time to improve the performance of their organizations [8].

The predictive capability of the process of Human Resource Analytics has now improved through the application of machine learning methods. Predictive models that are based on employee-related demographic, organizational and behavioral variables have shown to be quite promising in the identification of employees who are likely to leave an organization. The analytical approaches offer valuable insights that help managers make proactive retaining decisions, and not just a conventional human resource approach [9]. Likewise, empirical studies have indicated that managerial effectiveness is a very important factor in decreasing employee turnover. Good people management skills are related to increased employee satisfaction, increased organizational commitment, and decreased turnover intentions, which shows the importance of people management in employee retention [10].

Further, recent review studies have shown that the machine learning algorithms like Decision Trees, Random Forests, Logistic Regression and ensemble learning methods have been widely used in employee attrition prediction. While these models give more or less satisfactory predictive performance, it is noted that researchers have stressed the importance of augmenting the predictive

accuracy with the ability to make managerial interpretations to make them more useful to organizational decision-making [11]. Further, explainable predictive analytics is becoming a significant topic, as it can be used to determine not only who is more likely to quit an organization, but also the organizational drivers that could be responsible for those employees leaving. These methods help to make predictive models more transparent and help to evidence-based HRM [12]. Employee satisfaction is still known as one of the best indicators of organizational loyalty and the retention of employees. Studies have consistently shown that with greater job satisfaction, supportive working conditions and positive organizational relationships, there is greater likelihood of staying in the organization and better work performance [13]. Overall, the literature reviewed shows that business analytics and human resource management have become more relevant to each other. More empirical studies are needed, though, in order to explore organizational factors of employee turnover and to convert research results into actionable managerial strategies to enhance the retention of employees.

### **3. Material and Methods**

#### **3.1 Research Design**

The research followed the quantitative, cross-sectional, and explanatory research designs to analyze the determinants of employee turnover through business analytics [14]. Quantitative methodology was chosen due to its capacity to conduct thorough studies of connections between the factors and outcomes related to employee attrition through statistical analysis. This research integrates descriptive and predictive analytics in order to determine the main determinants of employee turnover and offer human resource management recommendations based on the evidence collected.

#### **3.2 Data Source**

The empirical analysis was performed based on the data from the IBM HR Analytics Employee Attrition & Performance dataset that is freely available online. This dataset contains information about 1,470 employees and 35 variables related to their demographic, organizational, and job characteristics that affect the employees' retention and HR management. Information is provided about the demographic characteristics of employees, salaries, job features, length of employment, satisfaction indices, performance indices, and workplace conditions. Due to its comprehensive

content and common application in HR analysis studies, the dataset is a good starting point for studying the factors affecting employee attrition.

### **3.3 study Variables**

Employee attrition, being the dependent variable studied, was categorized into two parts: those who remained loyal to the firm and those who voluntarily quit. Independent variables that were examined include demographic, organizational and workplace characteristics such as age, gender, marital status, education, educational background, distance from home, department, occupation, level in the hierarchy, business travel, overtime, monthly salary, stock option, salary raise, training sessions within one year, job satisfaction, environmental satisfaction, relationship satisfaction, job involvement, work-life balance, performance appraisal, tenure with the organization, tenure since last promotion, tenure under current boss and overall work experience. This was done since earlier studies had highlighted the importance of these factors in relation to retention of employees and organizational commitment.

### **3.4 Data Preparation**

Before carrying out any statistical analyses, a number of processes were carried out to enhance the quality of the data. The dataset was inspected for any missing values, duplicate values, and inconsistencies in the format of the variables. The categorical variables were encoded using one-hot encoding into numbers so as to facilitate prediction modeling, while the numerical variables were examined for any consistency and remained as such.

### **3.5 Statistical Analysis**

In the beginning, descriptive statistical methods were used to analyze the features of the sample used in the research. The mean, standard deviation, minimum, and maximum were among the statistics calculated for the primary variables. Frequency distribution tables were also created to analyze the patterns of employee turnover in various organizational departments and types of employees. This helped obtain the full picture of workforce and set up the foundation for prediction modeling.

### **3.6 Business Analytics Model**

Logistic Regression was chosen for analysis of factors influencing employee turnover since there were two classes of the dependent variable. An 80% training and 20% testing split was done on the dataset. The training set was used for parameter estimation while the testing set was utilized to test the model's prediction ability. Logistic Regression was chosen owing to its capability in

predicting probabilities of binary dependent variables and common use in business analytics and human resource management studies.

### **3.7 Model Evaluation**

To check the predictive power of the logistic regression model, the performance measures were employed. The model accuracy was used to check the overall number of correct classifications. In turn, the ROC curve and ROC-AUC were used to measure the model's ability to separate staying and leaving employees. It should be noted that the above metrics gave an opportunity for the objective analysis of the proposed business analytics approach.

### **3.8 Data Visualization**

Various graphical visualization methods have been used to aid in the interpretation of the findings of the analysis. The visualizations have been generated to help show how the employee attrition is distributed and the differences in the income earned monthly depending on whether the person had left the organization. The visualizations will help give a visual explanation of the factors leading to employee attrition.

### **3.9 Software and Analytical Tools**

All the statistical analysis, predictive modeling techniques, and graph visualizations were done using the Python programming language. The data pre-processing and data manipulation were carried out using Pandas and NumPy packages, whereas logistic regression modeling was developed and tested using Scikit-learn package. The graphs were generated using the Matplotlib package. All the above-mentioned analytical tools ensure accurate results of the study.

### **3.10 Research Framework**

This research adopted a systematic approach to data analysis using a framework that starts with data acquisition from the IBM HR Analytics dataset, and then data preprocessing and preparation. The next step in the framework involved conducting descriptive statistics analysis in order to understand the attributes of the work force and trends of employee attrition. Logistic regression model was used to determine the key factors leading to employee attrition.

## **4. Results**

In this part, the empirical results are presented that were derived from the IBM HR Analytics Employee Attrition data set that contains 1,470 employees and 35 organizational and individual

variables. In the analysis, descriptive statistics are combined with business analytics to determine the key factors of employee attrition.

#### 4.1 Descriptive Statistics

The descriptive statistics of the main quantitative variables are presented in Table 1. The average age of the participants is 36.92 years (SD = 9.14), which shows that there is an experienced workforce in the sample. The average monthly income of the employees is 6,502.93. However, the large standard deviation (4,707.96) implies great variability in the salaries of the employees.

On average, employees have been working in the organizations for 7.01 years. The average score for the work-life balance is 2.76 on a four-point scale. Job satisfaction (Mean = 2.73) and environmental satisfaction (Mean = 2.72) show that there are moderately positive attitudes of the employees towards their workplace.

**Table 1. Descriptive Statistics of Key Study Variables**

Variable	Mean	Standard Deviation	Minimum	Maximum
Age	36.92	9.14	18	60
Monthly Income	6502.93	4707.96	1009	19999
Distance from Home	9.19	8.11	1	29
Job Satisfaction	2.73	1.10	1	4
Environment Satisfaction	2.72	1.09	1	4
Work-Life Balance	2.76	0.71	1	4
Years at Company	7.01	6.13	0	40

As Table 1 shows, the workforce demonstrates substantial diversity in salary, tenure, and commuting distance. Such variability provides a suitable basis for examining the organizational and demographic determinants of employee attrition.

#### 4.2 Employee Attrition Profile

From the data provided, it is seen that 237 employees (16.1%) were involved in the attrition process, while 1,233 employees (83.9%) stayed in the organization. Such a disproportion means that the organization's staff is rather stable; however, the number of people leaving the company

cannot be ignored. Figure 1 presents the distribution of the attrition of employees in the organization. As can be seen from the graph, most of the employees stay in the organization (83.9%), while 16.1% leave.

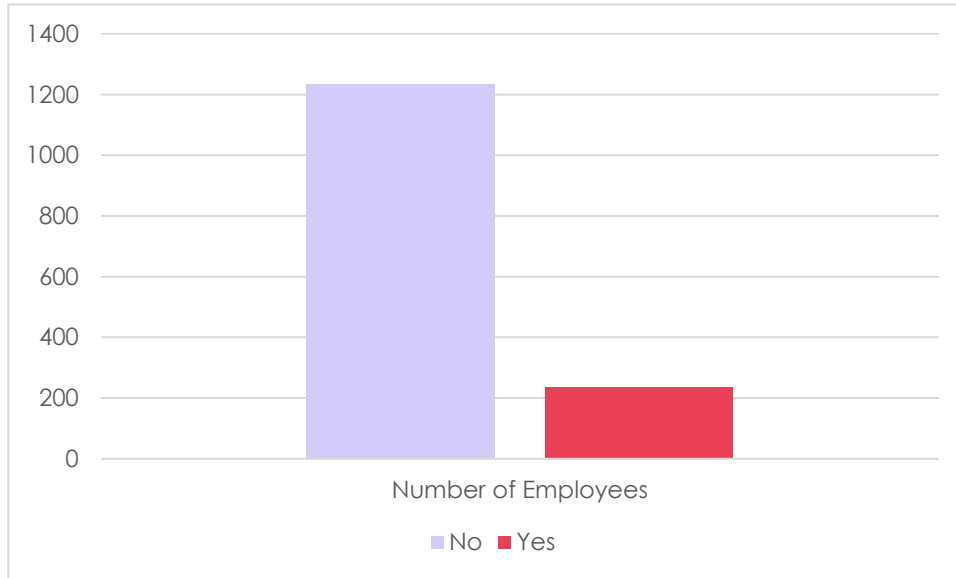


Figure 1. Distribution of Employee Attrition

### 4.3 Department-wise Attrition Analysis

Attrition of the employees differed from one department to another. The Research and Development department had the most number of people and was thus characterized by the greatest number of attrition cases. Similarly, the Sales department had a fair share of employee attrition cases, while the Human Resources department had fewer attrition cases because of its smaller size.

Table 2. Department-wise Distribution of Employee Attrition

Department	Stayed	Left
Human Resources	51	12
Research & Development	828	133
Sales	354	92

Prior to the analyses of the data, there was an elaborate procedure carried out on the dataset with the aim of improving the quality of the data and making the analysis more accurate. This involved

checking for missing observations, duplicates, and inconsistencies in the formatting of the variables in the dataset. Categorical variables were converted into numeric values by use of one hot encoding so as to facilitate prediction modeling, whereas the numeric variables were checked for consistencies and used as they were.

As shown in Table 2, there was higher employee turnover in the Sales department compared to other departments. This indicates that the departmental factors among others may influence the difference in employee retention.

#### 4.4 Business Analytics Model Performance

In order to analyze the ability of HR analytics to predict, a Logistic Regression analysis model was created on the basis of employee demographics, organization-related factors, and job-related factors. The categorical data were converted into one-hot encoding format.

The model achieved an accuracy of 87.53% on the test set and an ROC–AUC of 0.780, indicating good discriminatory performance for distinguishing employees likely to leave from those likely to remain.

**Table 3. Logistic Regression Model Performance**

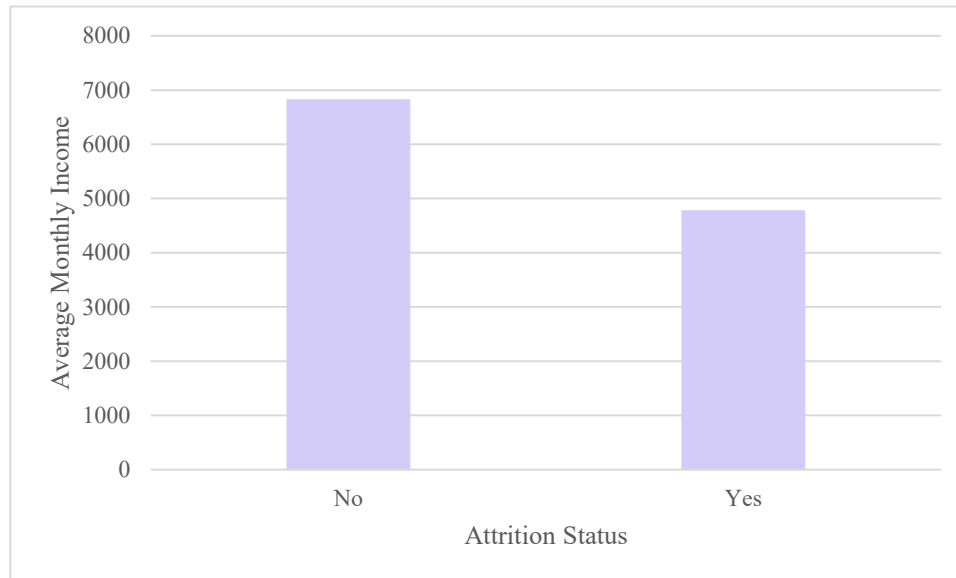
Performance Metric	Value
Accuracy	87.53%
ROC–AUC	0.780

As shown in Table 3, the proposed business analytics model demonstrated satisfactory prediction ability, indicating that HR analytics is useful for managing employee attrition. Although the predictions were highly satisfactory, more improvement can be made using ensemble learning algorithms and feature engineering.

#### 4.5 Interpretation of Key Determinants

From the above analyses, it appears that employee attrition is a result of a variety of demographic, organizational, and working environment factors. The variables of monthly income, work-life balance, job satisfaction, environmental satisfaction, time spent in the organization, and department were different among employees and hence could be potential factors influencing employee attrition. As a manager, the implication here is that one cannot view employee attrition as purely a personal issue but rather as something resulting from organizational issues which one

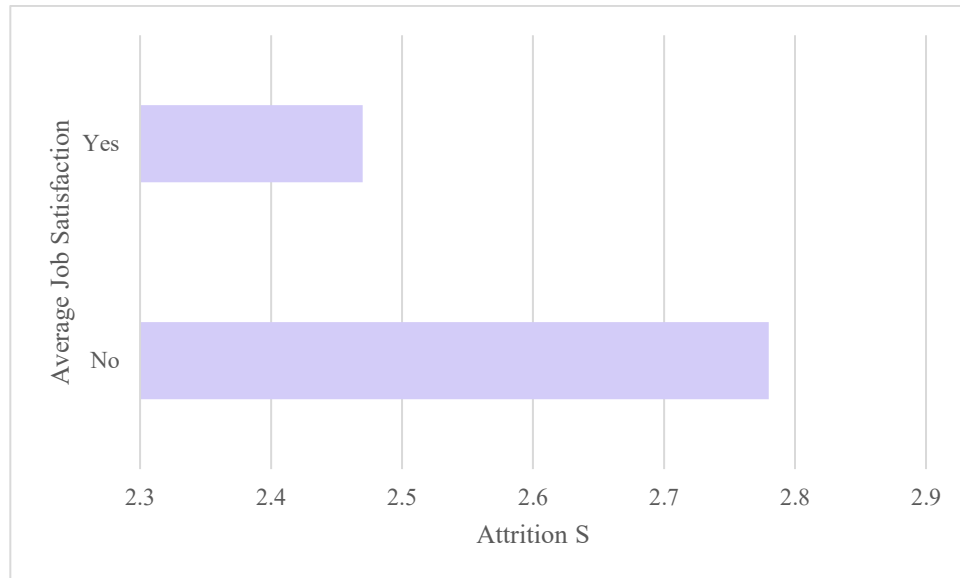
can measure through business analytics. In figure 2 below, the mean monthly income of the employees who remained in the organization was compared to that of those who left the organization. Those who left had lower incomes.



*Figure 2. Feature Importance of Employee Attrition Predictors*

#### **4.6 Managerial Insights from Business Analytics**

There is a business framework that gives the organization a way of managing its employees proactively using business analytics. Through the use of demographics of the employees, their job descriptions, remuneration, and levels of job satisfaction, the organizations will be able to single out employees who are more likely to leave the organization and take proactive measures to prevent that.



**Figure 3. Proposed Business Analytics Framework for Employee Attrition Management**

## 5. Discussion

The present study focused on the factors of employee attrition using the descriptive statistical analysis and business analytics techniques. As per the results, there are various variables which influence the attrition rate of employees and it is not dependent on just one variable alone. There are significant differences noted among the monthly income, satisfaction levels from their job, balance between work and life, years spent within the organization, and also the type of department the respondent works in. These results corroborate the notion of strong relationships between employee retention and employee's organizational attachment and workplace experiences.

Findings support previous studies which focus on the importance of employees having stronger connections to their organizations and being more embedded in their jobs to reduce intent to quit. Employees who feel that they have stability and the opportunity to grow in their career and in the supportive environment that they work in, tend to have a higher level of organizational commitment and lower intention to leave [15]. Likewise, research studying the job turnover of employees in various professions has found that organizational support, workplace conditions and career development are all very important factors in job retention or in deciding whether to leave an organization [16].

The positive correlation between job satisfaction and employee retention is also consistent with previous studies that showed the need for the stabilisation of organisational aspects. It is generally found that employees who are happy with working conditions, supportive leadership, meaningful

career progression are more likely to be committed to their organizations, while those who are not happy are more likely to be looking for a different job [17]. Similarly, past research has shown that increased job satisfaction leads to increased organizational loyalty and impacts employee performance, which in turn lowers the chances of them leaving the job [18]. Overall, all these results emphasize that improving job satisfaction should remain the goal of firms when seeking to retain qualified personnel.

The predictive abilities of the logistic regression model show the significance of evidence-based decision-making in HR management. Recent research indicates that through the use of predictive analytics on employees' information, firms can reap benefits from detecting employees that consider leaving the firm and thereby taking appropriate actions to retain them and plan their work more effectively [19]. Moreover, machine learning techniques have been found to be very helpful in detecting several trends in employees' turnover by taking into account a variety of organizational and behavioral variables, which can help managers to make decisions [20]. Explainable artificial intelligence allows taking the power tools of analytics to the next level, as it adds transparency and clarity to predictions and helps managers to see who is going to leave and why [21].

The findings of the research also provide some important considerations in terms of organizational management practice. The use of innovative technologies creates multiple opportunities to implement evidence-based HRM practices that could contribute to boosting employee engagement and retention and overall effectiveness of an organization [22]. The use of HRM practices could improve the process of decision making by transforming data on employees into information useful for managerial decision making. Such approach enables organizations to identify problems within their workforces at an early stage and make attempts to resolve them and remain productive and retain employees [23]. To conclude, the findings of the present study demonstrate that business analytics and human resource management is a feasible approach to discovering the factors behind employee turnover and developing evidence-based practices to retain them on.

## **6. Conclusion**

Retention has remained a key issue for companies aiming to have a stable, productive and loyal workforce. The study focused on determinants of employee attrition by combining descriptive statistical analysis with business analytics approach with the help of IBM HR Analytics Employee

Attrition dataset. The results show that employee turnover is affected by a set of demographic, organizational and workplace factors where four factors namely monthly income, job satisfaction, work-life balance, organizational tenure, and departmental characteristics were found to be most significant. In addition, the logistic regression model proved to be reasonably accurate in predicting, thus reinforcing the usefulness of business analytics in determining employees who may be at higher risk of leaving the organization. The research adds to the literature on human resource analytics by providing an example of how data can be used to aid in evidence-based decision making and enhance employee retention strategies. In the managerial sense, there is a need to focus on the employee satisfaction, competitiveness of compensation, career development opportunities, and work-life balance, combined with using predictive analytics for workforce planning. The study is conducted with the use of just one publicly available data set, but it is valuable for the strategic management of human resources. This study could be continued in the future with larger sets of multi-industry data, longitudinal data, and additional explainable machine learning methods to further improve employee attrition prediction and organizational decision-making.

## References

1. Sivakarathi G, Devi GP, Vaibhavi R. Prophesying attrition of MNC employees using machine learning. In 2024 International Conference on Advances in Computing, Communication and Applied Informatics (ACCAI) 2024 May 9 (pp. 1-8). IEEE.
2. Lim P, Parker A. Employee turnover. In *Mentoring millennials in an Asian context* 2020 Mar 16 (pp. 35-43). Emerald Publishing Limited.
3. McCartney S, Fu N. Bridging the gap: why, how and when HR analytics can impact organizational performance. *Management Decision*. 2022 Dec 19;60(13):25-47.
4. Taye D, Getnet B. The impact of employee turnover on organizational performance: A case study of Mada Walabu University, Bale Robe, Ethiopia. *American journal of pure and applied biosciences*. 2020;2(3):51-63.
5. Darko IL, Bans-Akutey A, Amoako P, Affum LK. Employee retention and organizational performance: Evidence from Ghana Police Service. *Annals of Management and Organization Research*. 2024;5(3):219-30.

6. Kiran PR, Chaubey A, Shastri RK. Role of HR analytics and attrition on organisational performance: a literature review leveraging the SCM-TBFO framework. *Benchmarking: An International Journal*. 2024 Nov 14;31(9):3102-29.
7. Shree B, Gobbilla U. Predicting Employee Attrition Through Engagement Metrics and eNPS: A Data-Driven Approach. In *2025 World Skills Conference on Universal Data Analytics and Sciences (WorldSUAS) 2025* Aug 22 (pp. 1-8). IEEE.
8. Ravesangar K, Narayanan S. Adoption of HR analytics to enhance employee retention in the workplace: A review. *Human Resources Management and Services*. 2024 Aug 12;6(3):3481-.
9. Fallucchi F, Coladangelo M, Giuliano R, William De Luca E. Predicting employee attrition using machine learning techniques. *Computers*. 2020 Nov 3;9(4):86.
10. Hoffman M, Tadelis S. People management skills, employee attrition, and manager rewards: An empirical analysis. *Journal of political economy*. 2021 Jan 1;129(1):243-85.
11. Alqahtani H, Almagrabi H, Alharbi A. Employee attrition prediction using machine learning models: A review paper. *Int. J. Artif. Intell. Appl.* 2024;15(2):23-49.
12. Varkiani SM, Pattarin F, Fabbri T, Fantoni G. Predicting employee attrition and explaining its determinants. *Expert Systems with Applications*. 2025 May 5;272:126575.
13. Nguyen TH, Pham LH, Nguyen HQ. Job satisfaction, work performance, and loyalty of employees in travel agencies. *Asian Journal of Business Research* Volume, 15 (2). 2025 May 1.
14. Pavansubhash. IBM HR Analytics Employee Attrition & Performance dataset [Internet]. Kaggle; 2017. Available from: <https://www.kaggle.com/datasets/pavansubhasht/ibm-hr-analytics-attrition-dataset>
15. Majumdarr S, Dasgupta SA. Understanding why do we stay in our jobs? A bibliometric and content analysis of job embeddedness in the past two decades (2001–2021). *Employee Relations: The International Journal*. 2024 Feb 21;46(2):309-39.
16. Kyeremeh J, Adom D, Essuman MA, Pek LS. Factors influencing teachers' attrition in public basic schools in Techiman Municipality, Ghana: An embedded mixed methods study. *Journal of Artificial Intelligence in Education & Learning Innovation*. 2025 Oct 8;1(1):66-88.
17. Choy MW, Kamoche K. Identifying stabilizing and destabilizing factors of job change: A qualitative study of employee retention in the Hong Kong travel agency industry. *Curr Issues Tour*. 2021;24(10):1375-1388.

18. Vuong B, Tung D, Tushar H, Quan T, Giao H. Determinates of factors influencing job satisfaction and organizational loyalty. *Manag Sci Lett*. 2021;11(1):203-212.
19. Căvescu AM, Popescu N. Predictive analytics in human resources management: Evaluating AIHR's role in talent retention. *Appl Math*. 2025;5(3):99.
20. Taner Z, Hızıroğlu OA, Hızıroğlu K. Leveraging machine learning methods for predicting employee turnover within the framework of human resources analytics. *J Intell Syst Theory Appl*. 2024;7(2):145-158.
21. Pavithran MS, Vadivel SM. Explainable attrition risk scoring for managerial retention decisions in human resource analytics. *Front Big Data*. 2025;8:1699561.
22. Chhibber S, Rawat B, Tyagi S, Gupta A. Assessing the practical implications of integrating blockchain technology into human resource management in the digital era: An empirical study. In: 2024 Sixth International Conference on Computational Intelligence and Communication Technologies (CCICT); 2024 Apr. Piscataway (NJ): IEEE; 2024. p.157-163.
23. Okon RI, Odionu CS, Bristol-Alagbariya BE. Integrating data-driven analytics into human resource management to improve decision-making and organizational effectiveness. *IRE J*. 2024;8(6):574.