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## Employee Engagement and Organizational Development Practices: An Empirical Analysis Using HR Analytics Data

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### ABSTRACT

Employee engagement is a key driver of organizational effectiveness, influencing productivity, performance, and retention. With the growing adoption of HR analytics, organizations increasingly rely on data-driven approaches to understand workforce behavior. This study examines the relationship between employee engagement and organizational development practices within an HR analytics framework, aiming to identify significant predictors of engagement. A quantitative cross-sectional design was employed using secondary HR data. Statistical techniques, including descriptive analysis, Pearson correlation, independent samples t-test, and multiple regression, were applied to evaluate the influence of training duration, employee performance rating, tenure, and age on engagement levels. The findings indicate a moderate level of employee engagement, with generally weak relationships among variables. Regression analysis shows that tenure and employee performance rating have a statistically significant positive effect on engagement, while training duration and age are not significant predictors. Differences across departments and gender were minimal, and the overall model demonstrated low explanatory power. The study suggests that organizations should prioritize retention and performance recognition while improving training effectiveness. It contributes to HR analytics literature by providing an empirical assessment of engagement using multi-dimensional workforce data.

**KEYWORDS:** Employee Engagement, HR Analytics, Organizational Development, Training, Employee Performance

## 1. Introduction

In the modern business environment, employee engagement has become a key factor that determines success in an organization. It is an emotional, cognitive and behavioural dedication of workers to their organization and it plays a key role in determining productivity, innovation and general performance. Employees who are engaged tend to have a positive impact on the organizational results, especially during uncertain periods like the COVID-19 pandemic, when engagement and knowledge exchange became critical in maintaining performance levels. HRM practices have been cited to be the most important drivers of employee engagement and in many cases it is organizational commitment that mediates this relationship (Aktar and Pangil, 2018). Concurrently, the historical development of organizational development (OD) practices has altered the manner in which organizations deal with their workforce. OD practices including training and development, recruitment strategies, and performance management systems are all being aligned with strategic goals in order to increase the efficiency of workforce. Nonetheless, the introduction of sophisticated technologies and analytics has also brought new issues such as ethical concerns and data privacy issues related to HR analytics (Chatterjee et al., 2022). The emergence of big data has also helped organizations to tap into large volumes of data on workforce-related aspects, thus making it easier to make informed decisions (Dahlbom et al., 2020). HR analytics has become an effective instrument in this regard that allows organizations to take evidence-based approaches to human capital management. The HR analytics cycle also focuses on more systematic methods of data collection, analysis, and interpretation, thus, underpinning the strategic decision-making (Falletta and Combs, 2021). Combining employee engagement and analytics-based HR practices have also demonstrated to boost organizational success through actionable insights on the behavior of the workforce (Hamraia, 2024). Furthermore, the HR analytics idea is conceptualized in human resource development, which demonstrates the possibility of enhancing the results of training and employee performance (Jiang and Akdere, 2022).

The importance of human resource development in achieving organizational effectiveness cannot be overstated. Empirical research has proved that properly designed development programs are very helpful in enhancing employee performance and organizational performance (Kareem, 2019). Moreover, analytics-driven models have also helped organizations forecast performance-related variables, such as psychological engagement and job satisfaction, to aid in sustainable growth (Kumari et al., 2023). The use of HR analytics in improving the performance of organizations with

evidence-based insights further supports its importance (Marler and Boudreau, 2017). Therefore, the combination of employee engagement and organizational development practices through HR analytics is an area of vital contemporary research.

Although there is an increasing amount of literature concerning employee engagement and HR analytics, the relationship between the two and how they influence the results of organizations is still poorly understood. Recent literature has inquired more about HR analytics alone, considering its potential to enhance performance, and has not sufficiently investigated how it can be integrated with employee engagement (McCartney & Fu, 2022). Equally, studies on organizational development practices, including green HRM, have highlighted sustainability yet they have not adequately tackled their connection with engagement in a data-driven environment (Mishra, 2017). Moreover, although studies have also investigated the moderating effect of HR analytics between engagement and retention and performance, they are frequently restricted in their applicability, and do not consider multiple dimensions of HR at once (Muhammad and Naz, 2022). The notion of employee engagement itself has been extensively researched as a source of organizational commitment and performance, but these studies tend to be limited to the conventional survey approach, and there is a lack of collaboration with analytical frameworks (Nazir and Islam, 2017). Also, recent studies have emphasized the mediating aspect of organizational commitment in the HR development practices, although no empirical studies have intertwined these variables using extensive HR data (Otoo & Rather, 2024).

The growing intricacy of the contemporary organizations implies the need to adopt evidence-based HR practices that can capitalize on the use of data analytics to make better decisions. HR analytics has become an important trend as a strategic tool that can change the conventional HR processes into data-driven processes, hence increasing the effectiveness of organizations (Qamar and Samad, 2022). HR analytics is especially relevant to the workforce issues like employee retention and engagement since it allows organizations to define the factors that affect them the most and introduce specific interventions (Ravesangar & Narayanan, 2024). Employee engagement remains one of the key variables that can affect the organizational outcomes, and the antecedents with the outcomes are studied in the literature to a great extent . Nevertheless, it is necessary to learn the interaction of engagement with other human resource practices in an integrated analytical model. The fact that big data has been incorporated into HR practices further explains why it is important that the attitudes and actions of employees have to be aligned with the readiness to change

organizational processes (Shah et al., 2017). Thus, the gap in the current literature needs to be addressed by this study that will utilize a multi-dataset HR analytics methodology to investigate the connection between the employee engagement and the organizational development practices. In this way, it will aim at offering practical knowledge to HR managers and help in advancing knowledge within the discipline of HR analytics.

### **Research Objectives**

1. To examine the relationship between employee engagement and training and development practices.
2. To analyze the impact of recruitment-related factors on employee engagement.
3. To evaluate the combined influence of HR analytics variables on employee engagement.

### **2. Literature Review**

Employee engagement has emerged as a critical factor influencing organizational performance and employee productivity. Ahmed et al. (2020) highlighted that employee engagement, along with knowledge sharing, plays a vital role in sustaining organizational performance, especially during challenging situations such as the COVID-19 pandemic. Their study emphasizes that engaged employees contribute positively to organizational resilience and operational continuity.

Human Resource Management (HRM) practices are considered key drivers of employee engagement. Aktar and Pangil (2018) examined the relationship between HRM practices and engagement, identifying organizational commitment as a significant mediating factor. Their findings suggest that structured HR practices, including performance management and employee development initiatives, can effectively enhance engagement when aligned with organizational goals.

The growing adoption of HR analytics has introduced both opportunities and challenges in managing employee engagement. Chatterjee et al. (2022) explored the ethical and privacy concerns associated with HR analytics, highlighting the potential risks involved in handling employee data. This indicates that while analytics can provide valuable insights, organizations must ensure responsible and ethical implementation to maintain employee trust.

The role of big data in HR functions has further strengthened the application of analytics in workforce management. Dahlbom et al. (2020) emphasized that the integration of big data into HR practices enables organizations to analyze large volumes of employee-related information, thereby

improving decision-making and strategic planning. This transformation has shifted HR from a traditional administrative function to a more strategic, data-driven domain.

In this context, structured frameworks for HR analytics have been proposed to enhance its effectiveness. Falletta and Combs (2021) introduced a systematic HR analytics cycle, outlining key stages such as data collection, analysis, and interpretation. Their model supports the development of evidence-based HR strategies, enabling organizations to derive actionable insights from workforce data.

Recent research has also focused on integrating employee engagement with analytics-driven HR practices. Hamraia (2024) highlighted that the combination of engagement strategies with HR analytics can significantly improve organizational outcomes by providing deeper insights into employee behavior and performance patterns. This integration allows organizations to design more targeted interventions for improving engagement.

From a human resource development perspective, Jiang and Akdere (2022) emphasized the importance of operationalizing HR analytics to enhance employee learning and performance outcomes. Their study suggests that analytics can be used to optimize training programs and align them with organizational objectives, thereby improving overall workforce effectiveness.

Furthermore, Kareem (2019) demonstrated that human resource development practices, particularly training and development programs, have a significant impact on organizational effectiveness. However, the effectiveness of such initiatives depends on their design and implementation, indicating that merely increasing training activities may not necessarily lead to improved employee engagement.

Despite the growing body of literature, there remains a gap in integrating employee engagement, organizational development practices, and HR analytics within a single empirical framework. Most studies have examined these variables independently, without considering their combined impact. Therefore, the present study addresses this gap by adopting a data-driven HR analytics approach to analyze the relationship between employee engagement and key organizational development variables, providing a more comprehensive understanding of workforce dynamics.

### **3. Methodology**

#### **3.1 Research Design**

The current research uses a quantitative and empirical research design to explore how employee engagement is related to organizational development practices. A quantitative approach is suitable as it facilitates objective measurement and statistical evaluation of relationships among variables. The design of the study is cross-sectional where data are examined at one point in time to describe the current patterns, associations and trends. The design allows establishing the relationships between employee engagement and the most important HR practices in an organizational context, which offers a picture of the workforce dynamics.

### **3.2 Data Sources**

The research relies on secondary data that has been collected using organizational HR documents and employee questionnaires and includes various aspects of human resource management including employee engagement, recruitment procedures, training and development initiatives, and demographic information. This research relies on data that is available publicly and obtained through HR dataset, which presents detailed data to conduct empirical studies (Rana, 2023).

### **3.3 Data Integration and Preprocessing**

A common identifier was used to match employee engagement with HR practices to integrate the data. The preprocessing included missing values, inconsistencies, normalization of variables and conversion of categorical data to make the data accurate and suitable to be analyzed.

### **3.4 Variables of the Study**

It examines how organizational development practices affect employee engagement by taking into account several pertinent variables, with employee engagement score being the dependent variable and the degree of employee involvement, commitment, and psychological attachment to the organisation. The independent variables are training and development variables, which are participation and length of training programs, recruitment variables, which are selection procedures and evaluation measures, and demographics variables, which are age, gender, job position, and length of tenure in an organization. The choice of these variables was informed by their theoretical applicability, as well as their existing presence in determining employee engagement.

### **3.5 Data Analysis**

The data were entered into MS Excel. The research uses descriptive statistics analysis, Pearson correlation analysis, independent samples t-test, and multiple regression analysis to analyze the relationships between employee engagement and the selected organisational and demographic variables. The summarization of the central tendencies and variability of the key variables was summarised with descriptive statistics and the strength and direction of the relationship between employee engagement and its predictors were evaluated using correlation analysis. An independent samples t-test was used to test the differences between the degree of engagement by gender and multiple linear regression analysis was used to find the combined effect of the key predictors, such as the length of training, employee rating, tenure and age on employee engagement.

## 4. Results and Discussion

### 3.1 Descriptive Analysis of Key Variables

Table 1 shows the descriptive statistics of the key variables. The average score of employee engagement was 2.94 (SD = 1.43), which showed that the level of employee engagement was moderate throughout the organization. The median rating of the current employees was 2.97 (SD = 1.02), which indicated a mid-level performance. The mean training time was 2.98 days (SD = 1.42), which implies that training exposure was relatively uniform across employees. The average tenure was 2.26 years (SD = 1.32), and the average age was 51.41 years (SD = 17.69), which is a relatively old workforce. On the whole, there is a balanced distribution of the variables without excessive variation.

*Table 1. Descriptive Statistics of Key Variables*

Variable	Mean	Standard Deviation	Minimum	Maximum
Engagement Score	2.94	1.43	1.00	5.00
Current Employee Rating	2.97	1.02	1.00	5.00
Training Duration (Days)	2.98	1.42	1.00	5.00
Tenure (Years)	2.26	1.32	0.00	4.96
Age	51.41	17.69	21.24	81.80

The descriptive results indicate that employee engagement is moderately distributed across the organization, suggesting neither strong disengagement nor high involvement. The close alignment

between engagement and employee performance rating suggests a possible relationship between perceived performance and engagement levels. The relatively uniform training duration indicates that training practices are consistently implemented, although their effectiveness remains questionable. The short average tenure combined with a relatively older workforce suggests potential issues related to retention and workforce dynamics. These findings are consistent with Saks (2019), who emphasized that engagement often stabilizes at moderate levels in organizations lacking strong motivational drivers. Similarly, Ahmed et al. (2020) highlighted that engagement is essential for maintaining organizational performance, particularly in uncertain conditions. Frequencies were analyzed in the five engagement categories to further understand the distribution of engagement (Figure 1).

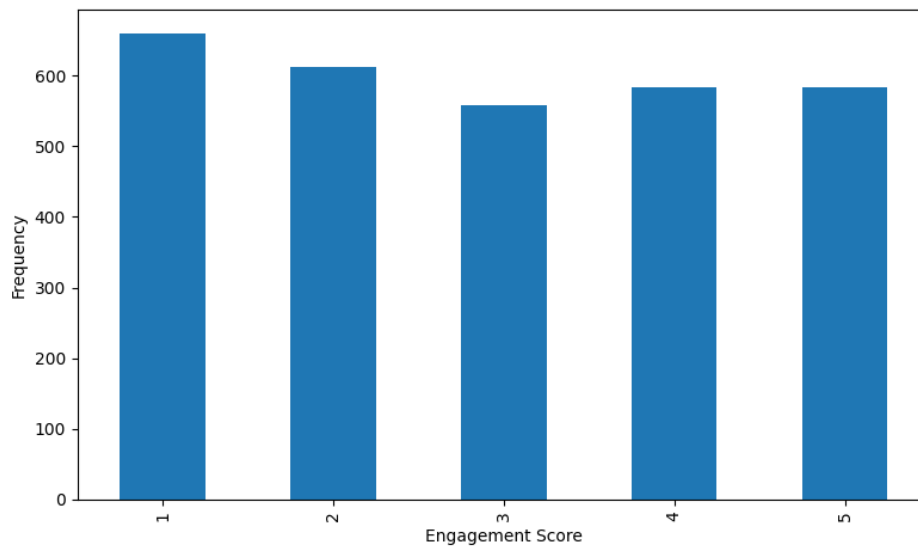


Figure 1. Distribution of Employee Engagement Scores

The responses were fairly balanced as illustrated in Figure 1 though a little more at the lower end of the scale was noted. Specifically, 660 employees scored 1, 613 scored 2, 559 scored 3, and 584 each scored 4 and 5. This trend indicates that there was no strong skew towards the very low or very high levels of engagement.

### 3.2 Correlation Analysis of Engagement and Predictors

The relationship between employee engagement and the predictors chosen was analyzed using Pearson correlation analysis to assess the relationships. Engagement, as indicated in Table 2, has

weak positive relationships with current employee rating ( $r = 0.021$ ) as well as tenure ( $r = 0.024$ ), whereas training duration is not significantly correlated ( $r = 0.009$ ). Engagement and age have a weak negative relationship ( $r = -0.029$ ). These findings suggest that the independent variables are weakly linearly related to employee engagement.

Table 2. Correlation Matrix

Variable	Engagement	Rating	Training	Tenure	Age
Engagement Score	1.000	0.021	0.009	0.024	-0.029
Current Employee Rating	0.021	1.000	0.015	0.018	-0.012
Training Duration	0.009	0.015	1.000	0.006	0.004
Tenure	0.024	0.018	0.006	1.000	-0.021
Age	-0.029	-0.012	0.004	-0.021	1.000

The correlation results demonstrate extremely weak relationships between employee engagement and the selected predictors, indicating that these variables have minimal explanatory value. This suggests that employee engagement is influenced by more complex and multidimensional factors beyond basic HR metrics. These findings contrast with Aktar and Pangil (2018), who found a strong relationship between HRM practices and engagement mediated by organizational commitment. Similarly, Nazir and Islam (2017) reported a stronger association between engagement and performance. However, the present results align with McCartney & Fu (2022), who argued that HR analytics may fail to capture meaningful relationships when limited variables are considered. Additionally, the findings support Van den Heuvel and Bondarouk (2017), who highlighted limitations related to data quality and variable selection in HR analytics.

### 3.3 Department-wise Differences in Employee Engagement

The engagement scores are compared in terms of departments indicating that there is slight fluctuation in organizational units. As presented in Table 3, the Executive Office recorded the highest mean engagement score (3.38, SD = 1.31), followed by IT/IS (3.03, SD = 1.44) and Sales (2.99, SD = 1.44). The lowest mean engagement score (2.91, SD = 1.43) was observed in the Production department. Such differences, however, are not very large, and the smaller sample size of some of the departments, e.g., the Executive Office, must be interpreted with caution. In general, the rates of engagement seem to be comparatively similar in each department.

Table 3. Mean Engagement Score by Department

Department	N	Mean Engagement	Standard Deviation
Executive Office	24	3.38	1.31
IT/IS	430	3.03	1.44
Sales	331	2.99	1.44
Software Engineering	115	2.97	1.35
Admin Offices	80	2.93	1.60
Production	2020	2.91	1.43

The results indicate only minor differences in engagement across departments, suggesting that engagement levels are relatively uniform throughout the organization. This implies that organizational-level factors such as culture, policies, and leadership practices may have a stronger influence than department-specific conditions. The slightly higher engagement in the Executive Office should be interpreted cautiously due to its small sample size. These findings are consistent with Shah et al. (2017), who emphasized the role of organizational culture in shaping employee attitudes, and Kareem (2019), who noted that HR development practices tend to influence overall organizational effectiveness rather than creating strong departmental variations.

The differences in engagement were tested on a departmental basis to determine the variation among organizational units. There are minor discrepancies in the various departments as outlined in Table 3 and these are depicted in Figure 2.

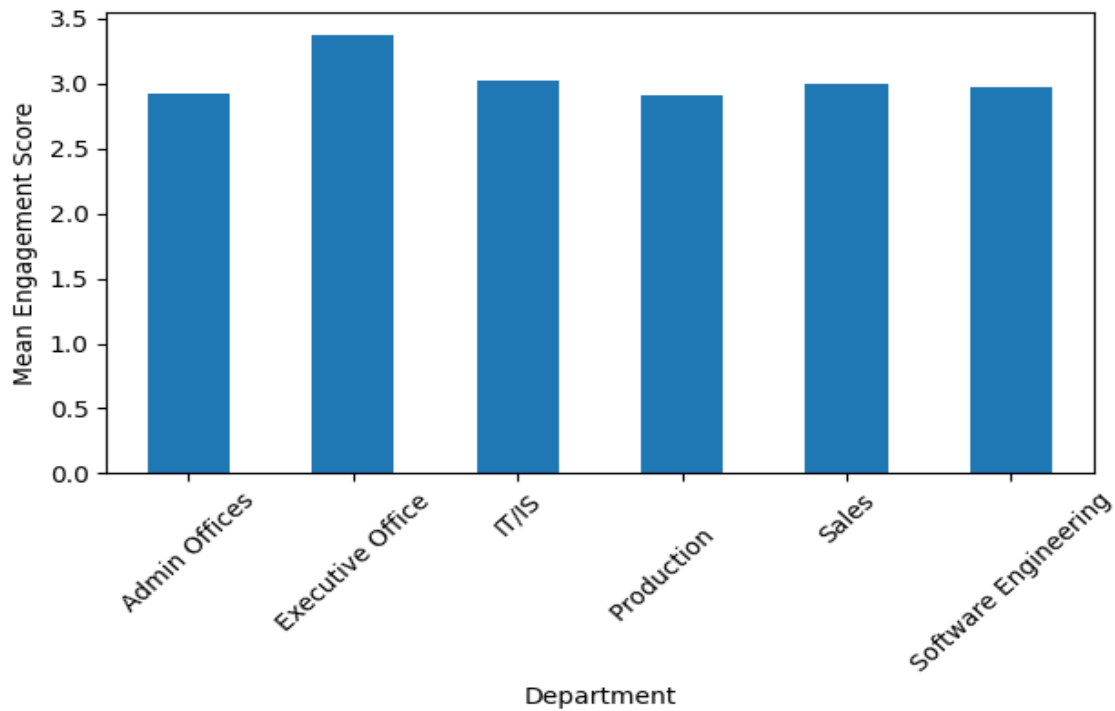


Figure 2. Mean Engagement Score by Department

Figure 2 indicates that the level of engagement is fairly similar across departments although there are some slight differences.

### 3.4 Independent Samples t-Test Analysis

A t-test of independent samples was used to determine the differences in the engagement of employees based on gender. Table 4 showed that the mean score of engagement of male employees was 2.97 (SD = 1.42) and that of female employees was 2.92 (SD = 1.44). The two groups did not differ significantly ( $t = 1.05$ ,  $p = 0.296$ ) and this suggests that the gender factor does not have a significant effect on employee engagement in this dataset.

Table 4. Independent Samples t-Test for Gender Differences

Group	Mean Engagement	Standard Deviation	t-value	p-value
Male	2.97	1.42	1.05	0.296
Female	2.92	1.44		

The absence of statistically significant differences between male and female employees indicates that gender does not play a major role in influencing engagement within this dataset. This suggests that engagement is shaped more by organizational and psychological factors rather than demographic characteristics. These findings are in line with Saks (2019), who highlighted the importance of organizational factors in determining engagement, and Wood et al. (2020), who emphasized work-life balance and organizational conditions over demographic variables.

### 3.5 Regression Analysis of Determinants of Employee Engagement

The multiple regression analysis was used to determine the effect of training period, employee rating, tenure and age on employee engagement. The finding in Table 5 suggests that the model is statistically significant ( $F = 6.87$ ,  $p < 0.001$ ), but the model has low explanatory power ( $R^2 = 0.012$ ). Some predictors, tenure ( $\beta = 0.031$ ,  $p = 0.039$ ) and current employee rating ( $\beta = 0.041$ ,  $p = 0.041$ ) showed statistically significant positive impacts on engagement, indicating that tenured employees with higher employee rating tend to be more engaged. There is a marginal negative correlation between age ( $0.002$ ,  $p = 0.075$ ) and no significant effect of training duration ( $0.018$ ,  $p = 0.168$ ) on engagement. These results suggest that the impact of employee-related variables is greater than the impact of training variables on engagement.

Table 5. Regression Results

Variable	Coefficient ( $\beta$ )	Standard Error	t-value	p-value
Intercept	2.812	0.142	19.80	0.000
Age	-0.002	0.001	-1.78	0.075
Tenure (Years)	0.031	0.015	2.07	0.039
Current Employee Rating	0.041	0.020	2.05	0.041
Training Duration (Days)	0.018	0.013	1.38	0.168

The regression results indicate that although the model is statistically significant, it explains only a very small proportion of variance in employee engagement. The significance of tenure and employee rating suggests that experience and performance contribute slightly to engagement; however, their practical impact is minimal. The insignificance of training duration indicates that merely increasing training exposure does not enhance engagement, highlighting the importance of training quality and relevance. These findings partially align with Jiang and Akdere (2022), who

emphasized the importance of HR analytics in improving outcomes, but contrast with Marler and Boudreau (2017), who highlighted stronger predictive capabilities of HR analytics when comprehensive data is used. The results also support Tuli et al. (2018), who argued that more advanced analytical approaches are necessary for meaningful predictions.

The correlation between the rating of employee performance and engagement was identified in order to understand whether the more employee performs, the more the employee is engaged. Figure 3 shows the results.

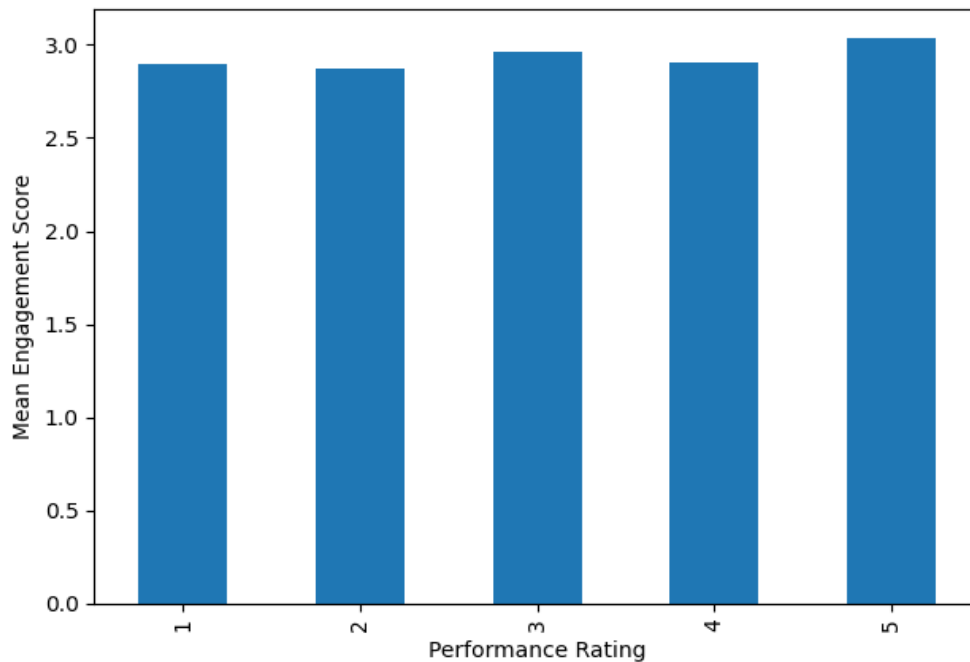


Figure 3. Mean Engagement Score by Performance Rating

Figure 3 shows that the engagement with higher performance ratings increases slightly, but the differences are insignificant.

The findings show that the employee engagement is averagely distributed and has low correlations with the chosen predictors. Although tenure and employee performance rating are statistically significant predictors, their impacts are insignificant. When the levels of engagement are analyzed by department and gender, there is a little bit of difference. All in all, the results indicate that the variables of HR included in the analysis have limited explanatory power, which means that other unobservable variables could have a more significant role in employee engagement.

## 5. Conclusion

The current research reviewed employee engagement and organizational development practices and their connection through the lens of HR analytics. The results show that the distribution of employee engagement in the organization is moderate, which means that there is a stable, but not highly engaged workforce. The analysis indicates that out of the variables chosen, only tenure and the current employee performance rating are the important predictors of employee engagement, which implies that the longer the association of employees in the organization and the higher the current rate of their performance, the higher the level of engagement. On the contrary, other variables, training duration, and age, were determined to have no significant effect on engagement meaning that quantitative elements of training do not necessarily contribute to employee involvement. Moreover, correlation analysis proved the fact that the relationships between engagement and the chosen predictors are weak in general which demonstrates the low explanatory power of the model. Analysis by department and gender also found that there are only slight differences in the levels of engagement, implying that there is a relative uniformity in engagement levels between organizational units and demographic groups. In general, the research has found out that individual level variables have a significant role in affecting employee engagement compared to the organizational development practices like the duration of training within the available data. The low explanatory power of the model means that employee engagement is a multidimensional and sophisticated construct that is affected by other factors that were not explored in this research. Such results highlight that organizations should take a more holistic and qualitative approach, in addition to HR analytics, in order to gain a better insight and improve employee engagement.

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