MODELING EMPLOYEE PERFORMANCE USING INTERACTION EFFECTS: A MULTIPLE LINEAR REGRESSION APPLICATION

Objective:

The goal was to analyze how job satisfaction, number of training hours, and their interaction influence employee performance scores. The client—a mid-sized HR consulting firm—wanted to demonstrate to their enterprise clients how combining variables leads to more accurate performance predictions.

Client Requirements:

- Include an **interaction term** to test if training impact depends on satisfaction level

- Use real or anonymized HR data

- Conduct multiple regression with all diagnostics

- Deliver a report and PowerPoint presentation for HR stakeholders

- Use APA format and include charts

Data Description:

A sample of **420 employee records** was used. The dataset included:

- **Performance Score** (target variable, 0–100 scale)

- **Job Satisfaction** (measured on a 1–5 Likert scale)

- **Training Hours Per Quarter** (continuous)

- **Department**, **Experience Level** (used for exploratory subgroup analysis)

Methodology:

1. **Data Preparation:**

    o Cleaned for missing values, especially in training hours

    o Scaled all variables for easier interpretation of interactions

    o Created interaction term: Satisfaction × TrainingHours

2. **Regression Model:**

$$\text{Performance}_i = \beta_0 + \beta_1 \cdot \text{Satisfaction}_i + \beta_2 \cdot \text{TrainingHours}_i + \beta_3 \cdot (\text{Satisfaction} \times \text{TrainingHours})_i + \epsilon_i$$

3. **Software:**

   o Analysis conducted in **R** using lm() and car for diagnostics

   o Graphs made with ggplot2

   o Report formatted using **R Markdown**

4. **Model Checks:**

   o No multicollinearity (VIFs < 2)

   o Interaction term checked for centering effects

   o Residuals were normally distributed (Shapiro-Wilk p = 0.43)

   o Heteroskedasticity not present (Breusch-Pagan p = 0.62)

Key Results:

- **Job Satisfaction** positively predicted performance (**β = 4.86, p < 0.001**)

- **Training Hours** had a smaller, marginal effect (**β = 1.34, p = 0.07**)

- The **interaction term was significant** (**β = 2.09, p = 0.02**)

  o Meaning: training hours only improved performance when job satisfaction was also high

- **Adjusted R² = 0.51**

Deliverables:

- **20-slide PowerPoint deck** tailored for HR executives

- Full **regression report** in APA style with tables and interaction plots

- **Diagnostic appendix** with plots and interpretation

- One-page **summary brief** highlighting actionable recommendations

Client Feedback:

The client used the model results in a C-suite workshop with a Fortune 500 firm. It helped drive policy change emphasizing joint initiatives to improve both employee engagement and upskilling. The firm reported that the interaction effect visualization was a key highlight.