**AA5222: Applied Analytics and Methods II: Survey Approaches**

**Assignment 3: Mediation**

**Thanmai Nallani**

**Banner ID:001390423**

**School of Professional Studies: Saint Louis University**

**Instructor: Anna-Elyse Brown**

**Mediation Analysis of Number of Projects and Time Spent at Company have indirect effects on Satisfaction through Last Performance Rating**

**Introduction:**

This study uses mediation modelling and multiple regression analysis to investigate the factors affecting satisfaction levels. The study investigates how satisfaction (Sat\_DV) is affected by evaluation metrics (Eval\_M), time components (Time\_C), and project variables (Proj\_IV) both directly and indirectly. The study uses a sample of 7,500 observations and several statistical methods, such as mediation analysis and regression diagnostics (normality tests, homoscedasticity checks), to comprehend the intricate relationship between these factors. By examining the ways in which Eval\_M mediates the relationship between project variables and overall satisfaction, the study sheds light on the processes by which these variables affect satisfaction levels.

**Purpose:**

This study's main goal is to examine and assess the intricate relationship between project variables (Proj\_IV) and satisfaction levels (Sat\_DV), with a focus on comprehending how evaluation metrics (Eval\_M) play a mediating function. By conducting a thorough statistical analysis of 7,500 observations, the study intends to investigate the direct relationship between project variables and time components and satisfaction levels, as well as the mediating role that assessment metrics play in this relationship. The study uses comprehensive regression diagnostics, mediation modelling, and multiple regression analysis to ascertain the overall, direct, and indirect effects of these relationships. The purpose of this study is to shed light on the mechanisms influencing satisfaction levels, assisting in the comprehension of both the direct effects and the nuanced interactions between variables that ultimately affect satisfaction in the setting. The results of this investigation will advance knowledge of the ways in which various elements combine to raise or lower satisfaction levels.

**Objective:**

This analysis's objective is to investigate the connections between satisfaction levels and several factors, including project involvement, evaluation ratings, and time commitment. By considering both direct and indirect impacts, it seeks to comprehend how these predictors affect satisfaction both separately and collectively. Additionally, the study looks for any mediating factors that might alter these associations and offer a more thorough understanding of the dynamics influencing employee happiness.

**Research Questions:**

1. How do evaluation results (Eval\_M), time commitment (Time\_C), and project involvement (Proj\_IV) affect employee satisfaction levels (Sat\_DV) both alone and together?   
2. How does the link between project engagement (Proj\_IV) and employee satisfaction levels (Sat\_DV) depend on evaluation ratings (Eval\_M)?   
3. How well do the residuals and expected values match the regression assumptions of homoscedasticity, linearity, and normality when modelling the variables influencing employee satisfaction?

**Assumptions Testing:**

**Normality**

A graph of a normal distribution

Description automatically generated

The histogram shows the distribution of regression standardized residuals for a dependent variable measuring satisfaction levels. The distribution is approximately normal (bell-shaped), with standardized residuals ranging from -3 to +3, a mean very close to zero (1.73E-14), and a standard deviation of 1.0 across 7,500 observations. There is a slight positive skew. The total pattern indicates that residuals follows a sufficient normal distribution, suggests the normality assumption for regression analysis is adequately met though that is not perfect.

A graph of a normal growth

Description automatically generated with medium confidence

This Normal P-P plot compares the observed cumulative probabilities and expected cumulative probabilities against of the standardized residuals for satisfaction level. The points follow the diagonal line closely, though with some minor deviations, particularly at the lower and upper ends. This suggests that the residuals are approximately normally distributed, with only slight difference from normality. For this regression analysis overall, the normality assumption is reasonably met, though not perfect.

**Linearity or Homoscedasticity**

A graph showing a number of blue dots

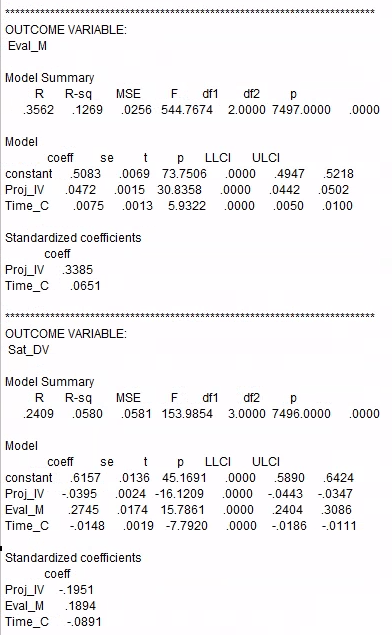
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Standardised residuals for satisfaction level are plotted versus projected values in this scatterplot. Residuals spread out more at the extremes of the pattern, which shows a little funnel shape and suggests some modest heteroscedasticity (uneven variance). Additionally, there is a slight downward trend, which suggests a slight break with linearity. The residuals are primarily confined within ±3 standard deviations, with points somewhat but not precisely distributed about zero. According to this, there are a few small issues with the model's fit even though the linearity and homoscedasticity assumptions are not seriously broken.

**Mediation Analysis:**

**Variables:**

* IV: number of projects
* Covariate: time spent at company
* DV: satisfaction
* Mediator: last evaluation

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R-sq =.1269 indicates that the model explains 12.69% of the variation. There is statistical significance in the model (F = 544.77, p <.0000). Proj\_IV and Time\_C, both predictors, are significant (p <.0000). Time\_C (.0651) is less influential than Proj\_IV (standardised coeff =.3385). According to the regression equation, Eval\_M =.5083 +.0472 (Proj\_IV) +.0075 (Time\_C), R-sq =.0580 indicates that the model explains 5.80% of the variation. There is statistical significance in the model (F = 153.99, p <.0000). The three predictors (Time\_C, Eval\_M, and Proj\_IV) are all significant (p <.0000). There is a negative impact of Proj\_IV (standardised coeff = -.1951). The most positively influencing factor is Eval\_M (standardised coeff =.1894). The following would be the regression equation: Sat\_DV =.6157 -.0395 (Proj\_IV) +.2745 (Eval\_M) -.0148 (Time\_C)

**A screenshot of a document

Description automatically generated**

The satisfaction total effect model (Sat\_DV) has a moderate but substantial explanatory power its R-squared value is.0267, meaning that the model accounts for about 2.67% of the variance in satisfaction (F = 102.97, p <.0000). With a standardised value of -.1310 for Proj\_IV and -.0767 for Time\_C, both predictors in this model exhibit negative correlations with satisfaction. According to the model equation, Sat\_DV =.7552 -.0265(Proj\_IV) -.0128(Time\_C), reductions in satisfaction levels are linked to increases in both predictors.

We can see how the links between variables are broken down when we look at the detailed effects analysis. The overall negative association between X and Y is represented by the total impact (-.0265), whereas the direct effect is more pronouncedly negative (-.0395). A mediating function is shown by the positive indirect effect through Eval\_M (.0130, with bootstrap CI:.0113 to.0148). Partial mediation, in which the mediator (Eval\_M) helps to partially balance the negative direct association, is indicated by the standardised indirect impact through Eval\_M (.0641, CI:.0557 to.0735). According to this pattern, the mediation pathway through Eval\_M offers a slight positive counterweight to the negative direct link between the variables, resulting in a total effect that is still negative but less severe than the direct effect alone.



A diagram of a workflow

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**Conclusion:**

When predicting satisfaction levels, the research shows a complex interaction between variables. The regression model shows a moderate level of explanatory power, though slight deviations from the fundamental assumptions of normality, linearity, and homoscedasticity. The results of the mediation study show that Eval\_M acts as a partial mediator, with its positive indirect effect (.0130) somewhat offsetting Proj\_IV's negative direct effect (-.0395) on satisfaction. The fact that the overall effect is still unfavourable (-.0265) despite this mediation indicates that Eval\_M only partially mitigates the adverse effect. Although significant, these associations only account for a small percentage of the variation in satisfaction levels, according to the model's relatively low R-squared values (2.67% to 12.69%), which suggests that other relevant factors that aren't included in this model may have an impact on contentment.

**Summary:**

This study examines the connections between employee satisfaction levels (Sat\_DV) and a few factors, including project involvement (Proj\_IV), evaluation scores (Eval\_M), and time commitment (Time\_C). With an R-squared value of.1269, the regression model is statistically significant and explains a moderate amount of the variance in satisfaction levels. While greater project involvement and time commitment had a negative impact on satisfaction, performance evaluations were found to be the most important positive predictor. Evaluation scores were found to partially mediate the association between project involvement and satisfaction, suggesting that they somewhat offset the adverse direct impacts, according to mediation analysis. The scatterplot of residuals shows that there are some small worries about heteroscedasticity, even though the regression conditions of normality and linearity are fairly met. Overall, the results indicate that quality performance feedback and balanced workloads are essential for improving employee satisfaction, beyond just project involvement and time commitment.

**Recommendations:**

1. **Improve Performance Evaluations:** Conduct frequent, thorough, and helpful performance reviews. By giving employees honest feedback and acknowledging their efforts, this can assist increase employee happiness and morale.   
  
2. **Encouraging Work-Life Balance:** Encouraging a healthy work-life balance to react the effects of extended workdays. Consider working remotely, flexible work hours, and regulations that encourage taking regular breaks and vacations.   
  
3. **Balanced Project Assignment**: To avoid staff overload, make sure that project assignments are divided equally. Maintain a fair and manageable task distribution by keeping an eye on workloads and making necessary modifications.

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