**Module 3: Exercise 3**-Order Fulfillment Dataset Analysis

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**Data Preparation**

The SEM model settings were as follows: The outer model analysis algorithm *PLS Mode M Basic*, the Inner model as *Linear*, and the Resampling method *Bootstrapping* with a resample size of 100. Bootstrapping tends to generate more stable resample path coefficients (and thus more reliable P values) with larger samples and with samples where the data points are evenly distributed on a scatter plot (2).

Our predictor variables were as follows:

Late = How late the delivery was in days

Cost = The freight cost measured in dollars

Courtesy = The courtesy of the deliverer, as perceived by the automaker

Packaging = The quality of the packaging of the car parts, as perceived by the automaker

Our observed variable indicator was *satisfaction,* which is defined as the satisfaction with delivery, as perceived by the automaker on a scale from 1-7. The structure the SEM model was set up so that the indicators are “effects” of the latent variables (late, cost, courtesy, and packaging) (3).

**Hypothesis**

Before assessing the data using a SEM model, it is hypothesized that the *courtesy* predictor will have a direct relationship and greatest statistical significance to the automaker’s satisfaction rating/score than the other predictors, this is due to the category of customer service typically being a top indicator of satisfactory ratings/scores. A similar correlation should also be seen with the *late* predictor, as this aligns with the *courtesy* predictor by both elements to be considered under the ‘customer service’ category.

**Analysis**

The question states, “What is the order of importance of the predictors with respect to satisfaction with car part delivery?”

In Figure A. Our SEM model was built using the variables: Late, Cost, Courtesy, and Packaging were created as our predictor variables with a direct link to the latent variable of Satisfaction.

Diagram

Description automatically generated

**Figure A.**

In **Figure A.** the model reveals all p-values have a statistical significance with all four predictor variables having less than .01 value, whereas the path coefficients varied in values. The variable *courtesy* seemed to have the highest direct relationship with a coefficient at 0.54, followed by *late* (delivery delay) at .40, *cost* (freight cost) at .25, and finally *packaging* (quality of packaging)at .18. It can also be seen that the R2 reflects a 54% variance indicating that the independent variables (predictor variables) have a significant effect on the dependent variable, *satisfaction*.

Chart, scatter chart

Description automatically generated

**Figure B. Satisfaction score in correlation with delay of delivery (measured in days late)**

**Figure B.** shows the correlation between the *late* (delay of delivery) and the satisfaction score as perceived by the automaker. It reveals a negative trend, indicating the longer the delay of delivery (late), the lower the satisfaction score. This predictor had the second highest direct relationship with a coefficient of .40, and a P-value of <.01 which is statistically significant thereby indicating strong evidence that there is a less than 1% probability the results are random.

Graphical user interface, application

Description automatically generated

**Figure C. Satisfaction score in correlation with freight cost (measured in dollars)**

**Figure C.** shows the correlation between the freight *cost* and the *satisfaction* score as perceived by the automaker. It reveals a negative trend, this graph demonstrates that the lower the cost, the higher the satisfaction score. This predictor had the third highest direct relationship with a coefficient of .25, and a P-value of <.01 which is statistically significant thereby indicating strong evidence that there is a less than 1% probability the results are random.

Chart, scatter chart

Description automatically generated

**Figure C. Satisfaction score in correlation with courtesy of deliverer**

**Figure C.** shows the direct relationship between the ‘*courtesy* of the deliverer’ and the *satisfaction* score as perceived by the automaker. It reveals a direct relationship and a positive trend, indicating the greater the level of *courtesy*, the higher the *satisfaction* score. This predictor had the highest direct relationship coefficient of .54, and a P-value of <.01 statistically significant and thereby indicating the strongest evidence among the predictors, that there is 1% probability the results are random.

Calendar

Description automatically generated with medium confidence

**Figure D. Satisfaction score correlation with the quality of packaging**

**Figure D.** shows the correlation between the ‘quality of *packaging’* and the satisfaction score as perceived by the automaker. It reveals a slight positive trend, indicating the better the quality of *packaging*, the higher the *satisfaction* score. This predictor had the least correlation with the *satisfaction score* supported by a beta coefficient .18, and a P-value of <.01.

**Conclusion**

In conclusion, our SEM model revealed the initial hypothesis that the order of importance of the predictors with respect to satisfaction with car part delivery, has the most supported direct relationship correlation to the predictor variable *courtesy*, followed closely by *late (delay of* *delivery)*. This is visually supported in Figure C. where the trendline is positive between the scoring of *courtesy* and *satisfaction* score and statistically with beta coefficient of .54 and R2 value of 54%. According to the SEM assessment and the data visualizations that accompany them, the overall order of importance (greatest to least) are as follows: Courtesy, Late, Cost, Packaging. Further data sampling over a longer period of time may be needed to determine if there are other factors that influence these predictor results, such as time of year, weather, or a pandemic. The data this assessment concludes that customer service which encompasses the *courtesy and delay of delivery,* both a sign of respect to the customer, is proved to be a primary indicator of overall customer satisfaction.

**Discrepancies**

There continues to be uncertainty as to ‘why’ the P-values are so similarly close yet the scatter plots vary so significantly. Additional research will need to be conducted to determine if the data preparation and SEM model settings were reason for the uncertainty, or if full interpretation of the P-value results in correlation to the scatterplots and trendline which did not reveal a ‘good-fit’ is still not fully understood.

Unfortunately, the missed opportunity in this analysis was to have the latent variables *late, and courtesy* be aggregated into a single observed variable (1) labeled ‘customer service’ and then analyzed to determine if it would have had a significant impact.

References

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