Application of Linear Model to Determine the Relationship of the Team Developmental Performance Metrics in CES

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Abstract

Technical support plays a vital role in modern businesses today. As most businesses rely on digital infrastructure, technical support provides solutions to customers' issues and queries. It helps in the retention of customers. This paper aims to measure performance of technical support through the use of linear model applied to a BPO company. The results were further analyzed using the principal components analysis. The results show that the Technical Knowledge contributes to the model as the most significant factor with a value of 1.05. Next to it is the Support Citizenship which is at 0.95. Communication, was at 0.91 and Context Awareness at 0.76. At the very least, Diagnosis/Analysis was at 0.69.

Keywords: *Technical support, performance, customer effort score*

INTRODUCTION

Technical support roles require interaction to customers whenever technical difficulties occur when availing technical services and using technological products. Technical issues are typically raised by contacting technical support team either via phone call or by creating a support ticket via the product's support services portal. A technical support takes ownership of a support ticket and attends the customer's reported technical issue by responding to queries, providing solutions or workarounds actionable on the customer's side. For each technical support service completed, a customer satisfaction survey is sent to determine feedback from the service that has been rendered by the technical support team.

Using customer satisfaction surveys to collect customer feedback and control for service quality is a common practice in many industries (Han et al., 2021). Gathering feedbacks from the customer is vital to identify opportunities for improvement especially in managing each interaction where a technical support is primarily in charge to a support ticket. As part of performance management, these surveys take part in the overall monthly performance. Learning what it takes to satisfy customers is not an easy task, however, particularly for service products, where human interactions often assume considerable importance (Mohr et al., 1995). All surveys are evaluated based on team developmental competencies. One significant development in performance measurement of technical support is the Customer Effort Score or CES. CES was introduced in 2010 by the the Corporate Executive Board to examine links between customer service and loyalty (Dixon, Freeman &Toman, 2010). The CES measures the efforts of customers in completing different types of transactions such as purchase, a service request or just an interaction with the technical support team. Similar to Customer Satisfactiorn (CSAT) process, CES feedbacks are also evaluated with the technical support's interaction. By using the CES scoring, it helps to improve the customer's experience on an effortless way of contacting the technical support team.

This study aims to apply a linear model which describes the relationship of CES survey results to all the team developmental performance metrics after a CES survey rubric review and CES to CSAT.

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LITERATURE REVIEW

For any organization, a set of core competencies must be defined to determine the areas of strengths and weaknesses of the technical support team. As technical support team constantly provides services and interacts with customers, five team developmental competencies must be evaluated. These core competencies include:

Diagnosis/Analysis (DA)
This competency pertains to the identification of an issue based on present symptoms like errors and the review of an ongoing scenario where expected and unexpected behaviors occur. Ask appropriate questions when necessary to effectively and efficiently resolve the issue, connects different customer clues to exactly identify the concern.

Technical Knowledge (TK)
This refers to the mastery and troubleshooting skills required to perform specific tasks. Exhibiting deep knowledge or troubleshooting skills which significantly reduce the time to diagnose, resolve or mitigate the customer issue.

Communication (COM)
This type of competency refers to the ability to understand and acknowledge customer's reported concern and convey one's thoughts by responding with ideas and questions. Communicating clearly and succinctly in language/tone appropriate for the customer's level of technical knowledge.

Context Awareness (CA)
Context Awareness is knowing the urgency and being resourceful in picking up contextual clues with each response given by the customer. Understanding the business impact and urgency for the customer and advocating on their behalf. Giving the customer solution options that are appropriate for their cost situation.

Support Citizenship (SC)
This means that you exhibit a good support citizen by following the guidelines and utilizing the tools well to drive a sustainable and efficient support operation. Being process compliant dealing with situations where a process workflow has been put into place during support ticket handling. These five core competencies were measured by monitoring and evaluating the Support tickets generated. The rubric team analyzes and identifies the team developmental competencies which potentially influences customer's CES feedback and rating. Rubric team comes up with a feedback type each case evaluation. The first feedback type is: Kudos. This implies positive feedback that the technical support has done an excellent job applying a specific competency all throughout the interaction in the case. Whenever there is constructive feedback to the technical support's case handling, a Note is given. As the second feedback type, a Note is given when there was a minor commentary from the customer against the technical support's case handling. If for some reasons where a technical support's action resulted to a major commentary from the customer, the third feedback type is given – Opportunity. This means that during the interaction on the case, the customer's effortless experience has been impacted. The conceptual framework to analyze the relationship of team developmental competency is shown in Figure 1. Based on the framework, Communication, Diagnosis/Analysis, Support Citizenship, Context Awareness, and Technical Knowledge are associated with Customer Effort Score. In this study, the evaluation of CES is linked to high effort cases (CES rating equal or lower than 3) in order to identify the impact to the score. This also identifies which competency is to be treated as areas for improvement.

Figure 1 – Framework of CES with Team Developmental Competencies

Considering the five developmental team core competencies and the different feedback types received, the paper aims to answer the following questions:

1.   What is the overall impact of Team Developmental Competency to CES survey rating?

2.   Which Team Developmental Competency greatly impacts customer's feedback in terms of an effortless experience through CES survey?

METHODOLOGY

This paper analyses data based on the results of customer survey every after a support ticket is completed.

All of the closed support tickets logged through the ticketing tool are sent a survey seeking customer's feedback for CSAT and CES. The customer survey form sent to the customers are answered using a Likert Scale both for CSAT and CES. The scale used is 1-5, where 1 is the lowest or unsatisfactory rating and 5 is the highest or satisfactory rating.

 The survey questions are:

(1) How satisfied are you with the support representative?

(2) The company made it easy for me to handle my issue.

Each customer is expected to respond to the survey after a support ticket's closure. However, not all customers are taking their time to answer and submit their feedback. Using the organization's ticketing tool, all available survey responses are extracted from the system. They are tabulated as a whole to evaluate the overall performance of the whole team. Also, survey responses are tabulated for each technical support.

Survey results could end up getting an Effortless Experience (CES) and Very Satisfied (CSAT) rating. A rating of 5 or a 4 is evaluated as follows: for the CES score means that the customer had an effortless experience and for the CSAT means, Very Satisfied and Satisfied rating with the assistance provided by the technical support, both are positive feedbacks. However, a rating of 3, a 2 or a 1 is evaluated as follows: CES score means a Hight Effort case which required more effort for customers to complete a request in the interaction and for the CSAT means, Very Dissatisfied to Neutral rating with the assistance provided by the technical support, both are negative feedbacks.

In order for technical support to receive guidance on how to improve the interaction achieving an effortless experience and a very satisfactory assistance provided to the customer, a Rubric team is evaluating each support ticket which received a rating equal or lower than 3 in the CES rating. A support ticket is evaluated from the initial interaction up until the case has been closed. Each response of the technical support whether via chat conversation or email conversation is reviewed. The result of the review and evaluation yields to a team developmental competency and tagged as either a Kudos, a Note, or an Opportunity.

The study utilized the linear model technique to determine the relationship and impact of each competency to the CES score. Given the data obtained from the rubric team, principal component analysis (PCA) will also be utilized to validate the impact of each competency. JMP 16.2.0 was utilized as the statistical tool for this case study. The linear model (1) was formulated to show that CES is dependent to the team developmental competencies (independent variables) : (1) Diagnosis/Analysis -DA , (2) Technical Knowledge - TK, (3) Communication - COM, (4) Context

Awareness - CA, and (5) Support Citizenship - SC. β_i is the coefficient which indicates the impact of each team developmental competency to CES.

$$CES= \alpha+ \beta_1*DA+\beta_2*TK+\beta_3*COM+\beta_4*CA+\beta_5*SC \quad (1)$$

Table 1 shows the sample raw data as a result of the customer survey. Each row corresponds to a support ticket. Note: support ticket details like ticket numbers, customer name and others were not included in compliance to data privacy. The columns CSAT and CES are fields which values came from customer feedbacks. These values are the actual rating (Likert Scale 1-5) given to the support tickets handled by each technical support. The columns Team Development Competencies and Feedback Type are the evaluation given by the Rubric team. The columns Communication, Contact Awareness, Diagnosis/Analysis, Support Citizenship, and Technical Knowledge contain the values 1-3 in Likert Scale. A support ticket's Rubric evaluation would yield to a value 3 for Kudos, 2 for Note and 1 for Opportunity. Each ticket's competency is assumed to have a value of 3 – Kudos if the evaluation is not the competency tagged on a support ticket. A support ticket's evaluation flagged with a competency will follow the feedback type given. Say for example, the last record in Table 1 was flagged Opportunity under Feedback type with Communication as the competency. Thus, Communication will result to 1 - Opportunity. Then, the rest of the competencies will have a default value of 3 – Kudos, assuming that the other competencies were evaluated with the Kudos rating. This assumption was made since only one competency is used to flag a support ticket after the rubric team evaluation.

Table 1 – Sample Data of CES/CSAT with Team Developmental Competency Evaluation

CSAT	Team Development Competencies	Feedback Type	CES	Communication	Context Awareness	Diagnosis/ Analysis	Support Citizenship	Technical Knowledge
5	Communication	Kudos	3	3	3	3	3	3
5	Communication	Note	3	2	3	3	3	3
5	Communication	Kudos	3	3	3	3	3	3
3	Communication	Kudos	1	1	3	3	3	3
3	Communication	Note	1	1	3	3	3	3
5	Communication	Kudos	3	3	3	3	3	3
3	Communication	Kudos	3	3	3	3	3	3
5	Communication	Kudos	2	2	3	3	3	3
5	Communication	Note	3	2	3	3	3	3
2	Communication	Kudos	3	3	3	3	3	3
3	Communication	Note	3	2	3	3	3	3
2	Communication	Kudos	1	1	3	3	3	3
2	Communication	Kudos	2	2	3	3	3	3
2	Communication	Opportunity	3	1	3	3	3	3

FINDINGS AND DISCUSSION

Linear model between CES and to the five team developmental competencies were computed based on the data obtained from customer feedback survey with the assumptions relative to the results of the evaluation by the rubric team. The results indicated that the model explained 75.85% $(\llbracket R \rrbracket^2)$ of the variance and that the model was a significant predictor of CES, $F(5,138) = 86.69$, $p = 7.74E-41$.

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Technical Knowledge contributes to the model as the most significant factor at $\beta_2 = 1.05$. Next to it is Support Citizenship which is at $\beta_5 = 0.95$. Communication, was at $\beta_3 = 0.91$ and Context Awareness at $\beta_4 = 0.76$. At the very least, Diagnosis/Analysis was at $\beta_1 = 0.69$. The final model was:

$$CES = -10.12 + 0.69*DA + 1.05*TK + 0.91*COM + 0.76*CA + 0.95*SC \quad (1') \ .$$

Given the model presented above, it shows that R^2 at 75.85% shows the measure how well the team developmental competencies as variables to explain another's behaviors within a multi-linear regression model. As seen in the model, all of the team developmental competencies have positive impact to CES. The proportional impact of each team developmental competencies were all shown as β_i with the actual computed values in the above model. While the model gives you an idea of the relationship between CES and all the team developmental competencies, these are all estimated values based on the computation obtained from the data available. In order to further analyze the data, Principal Component Analysis (PCA) was utilized in order to better identify the most influential variables in the data.

Using JMP, the data is feed for PCA to further analyze. Table 2 is presented below. The table has the columns, Number (representing a Principal Component number), Eigenvalues (represents the total amount of variance that can be explained by a given principal component), Variance Proportion (represents the proportion of variance explained), and Cumulative Variance Proportion (represents the cumulative value of variance proportion).

Eigenvalues practically is always positive in value. If eigenvalues are greater than zero, then it is a good indication. Since variance cannot be negative, negative eigenvalues imply that a model is ill-conditioned. A value which is close to zero implies that there is item multicollinearity.
Similarly, it is also defined as the sum of squared component loadings across all items for each component, which represent the amount of variance in each item that can be explained by the principal component.

The results obtained using JMP software, identifies the most influential variables or the so-called Principal Components. An Eigenvalue of greater than 1 means significance to be among the principal components. Thus, first, second, third and fourth components are significant components. Cumulative variation proportion is computed from the actual percentage that each principal component is explaining. The acceptable level of cumulative variance is at 80% where in this case, the first to the fourth component has the cumulative value of 92.84%. Principal Components should be able to describe at least 80% of the variance.

Table 2 – Total Variance

Number	Eigenvalue	Variance Proportion	Cumulative Variance Proportion
1	1.3367	26.733	26.733
2	1.1968	23.935	50.668
3	1.0747	21.495	72.163
4	1.0341	20.683	92.846
5	0.3577	7.154	100

A common way to determine the number of Principal Component is by using a graphical representation called scree plot. It shows the eigenvalues against the corresponding principal

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component that explain most of the variation of the data and it can check whether PCA works well on your data or not. The number of PCs retained is then subjectively determined by locating the point at which the graph shows a distinct change in the slope. Figure 2 – Scree Plot shows the graph of the data. The graph generally shows a curve plot. An ideal graph is curve showing to be steep, and then bends at an "elbow" — this is your cutting-off point or located at the point at which the graph shows a distinct change in the slope — and after that flattens out. It is desirable to find a sharp reduction in the size of the eigenvalues (like a cliff), with the rest of the smaller eigenvalues constituting rubble. When the eigenvalues drop dramatically in size, an additional factor would add relatively little to the information already extracted. Because scree plots can be subjective and arbitrary to interpret, their primary utility is in providing two or three reasonable values of m to consider. In Figure 2, point 1, 2, 3 and 4 are the principal components which are enough to describe the data. Following Table 2, it corresponds to eigenvalues which are greater than 1.
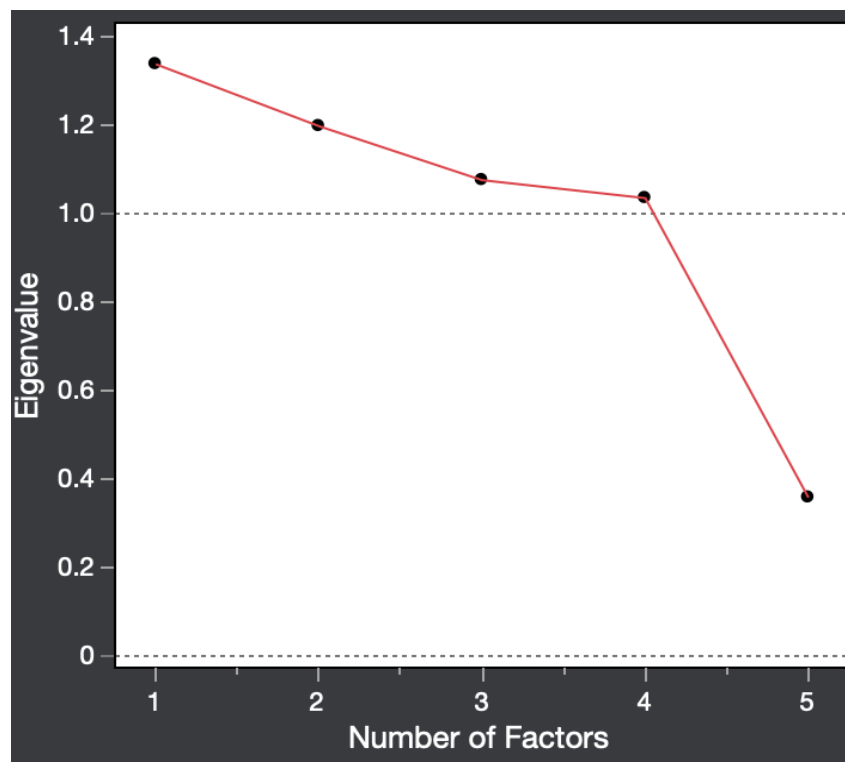

Figure 2 – Scree Plot

If the first two or three PCs have capture most of the information, then we can ignore the rest without losing anything important. In this case, however, the cumulative variance of proportion reaches only at least 80% until the fourth principal components. Since it consequently ended up with up to four principal components (more than 3), PCA might not be the best way to visualize the data. Thus, reduction techniques may be considered.

CONCLUSION AND FURTHER RESEARCH

The linear model formulated was established showing the relationship of team developmental competencies to Customer Effort Score. The factor which has the greatest impact to CES is Technical

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Knowledge, followed by Support Citizenship, Communication, Diagnosis/Analysis and the least was Context Awareness. In terms of the linear model formulated, Technical Knowledge greatly impacts CES and this make sense given that the customer feedback surveys are about technical support interactions with customers. Using Principal Component Analysis is a different approach in analyzing survey data which could help interpret results further from the linear model formulated.

As a recommendation, expanding the customer survey and the rubric team's methodology in evaluating customer feedbacks will help improve the research and analysis. Formulating a well-structured survey like the one used by Tamonob, etal (2020) may be used to get a more meaningful data analysis.

REFERENCES

Basto, M., & Pereira, J. M. (2012). An SPSS R-menu for ordinal factor analysis. Journal of Statistical Software, 46(4). https://doi.org/10.18637/jss.v046.i04

Dixon, M., Freeman, K., & Toman, N. (2010). Stop trying to delight your customers. Harvard Business Review, 88(7–8).

Faed, A., Hussain, O. K., Faed, M., & Saberi, Z. (2012). Linear modelling and optimization to evaluate customer satisfaction and loyalty. Proceedings - 9th IEEE International Conference on E-Business Engineering, ICEBE 2012. https://doi.org/10.1109/ICEBE.2012.32

Han, S., & Anderson, C. K. (2022). The dynamic customer engagement behaviors in the customer satisfaction survey. Decision Support Systems, 154. https://doi.org/10.1016/j.dss.2021.113708

Mohr, L. A., & Bitner, M. J. (1995). The role of employee effort in satisfaction with service transactions.
Journal of Business Research, 32(3). https://doi.org/10.1016/0148-2963(94)00049-K

Tamonob, A. M., Saefuddin, A., & Wigena, A. (2020). Principal component analysis with successive interval in K-Means Cluster Analysis (Study case: Poverty data 2013 in East Nusa Tenggara). IOP Conference Series: Materials Science and Engineering, 823(1). https://doi.org/10.1088/1757 899X/823/1/012055

Zani, S., & Berzieri, L. (2008). Measuring Customer Satisfaction Using Ordinal Variables: an Application in a Survey on a Contact Center. Statistica Applicata, 20(3–4).